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THE JOHN MURRAY EXPEDITION 1933–34

SCIENTIFIC REPORTS

VOLUME VIII, No. 1

THE FREE-SWIMMING PLANKTONIC COPEPODA

SYSTEMATIC ACCOUNT

BY

R. B. SEYMOUR SEWELL, C.I.E., Sc.D., F.R.S.
(Lieut.-Colonel, I.M.S. [ret.])

WITH SEVENTY-ONE TEXT-FIGURES

LONDON:
PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM
SOLD BY
B. Quaritch, Ltd., 11 Grafton Street, New Bond Street, London, W. 1;
Oxford University Press, Warwick Square, London, E.C. 4;
H.M. Stationery Office, London, S.W. 1
AND AT
The British Museum (Natural History), Cromwell Road, London, S.W. 7
1947

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Price One Pound Ten Shillings

[*Issued 20th March, 1947*]

DESIGNED AND
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BY
ADLARD & SON
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CONTENTS.

	PAGE
Introduction	1
Parasites	1
List of Species	4
Systematic Account	13
Appendix	292

INTRODUCTION.

In the present Report I have given an account of the various species of free-living planktonic Copepoda that were obtained by the "John Murray" Expedition and, in addition, I have included records of the capture of certain species that in previous years were obtained by the R.I.M.S. "Investigator" in Indian waters, but in areas lying somewhat to the east of the area investigated by the Expedition in 1933–34.

The species obtained are given below:

Parasites.

A number of species, both surface-living and deep-dwelling forms, were found to be infected with parasites. With (1915) has recorded the presence of certain ectoparasites, the true nature of which appears to be at present unidentified, from the following species:

Chiridius armatus.
Gaidius tenuispinus.
G. brevispinus.

Gætanus kruppi
G. pileatus.
G. latifrons.
Undeuchæta superba.
Chirundina notacantha.

In certain of these the parasite consisted of a short stalk bearing an oval or irregular sac-like body. Similar ectoparasites occurred on a number of species in the present collection. These appear to belong to at least two different forms. In the first group the stalk of the parasite is comparatively long, at least half as long as the terminal cyst, and narrow: this form was present on specimens of the following species:

Gœtanus antarcticus Wolfenden	Sta. 61	depth 1500–0 m.
G. curvicornis Sars	,, 61	,, 1500–0 m.
G. kruppi Giesbrecht	,, 131	,, 1500–0 m.
Euchirella maxima Wolfenden	,, 172	,, 1500–0 m.
E. pulchra (Lubbock)	,, 131	,, 1500–0 m.
Pseudochirella notacantha Sars	,, 61	,, 1500–0 m.
Xanthocalanus greeni Farran	,, 172	,, 1500–0 m.
Lophothrix frontalis Giesbrecht	,, 131	,, 1500–0 m.
Pleuromamma xiphias (Giesbrecht)	,, 172	,, 1500–0 m.

In the second form the parasite consisted of a stalk that was short and broad, very much shorter than half the length of the cyst: this form occurred on the following species:

Bathycalanus bradyi (Wolfenden) juv.	Sta. 131	depth 1500–0 m.
Megacalanus princeps (Wolfenden)	,, 131	,, 1500–0 m.
Gœtanus antarcticus Wolfenden	,, 61	,, 1500–0 m.
G. brevicornis Esterly	,, 131	,, 1500–0 m.
G. kruppi Giesbrecht	,, 131	,, 1500–0 m.
Euchirella maxima Wolfenden	,, 172	,, 1500–0, 450–0 m.
Pseudochirella notacantha Sars	,, 61	,, 1500–0 m.
Onchocalanus affinis With	,, 172	,, 1500–0, 850–0 m.
O. trigoniceps Sars	,, 172	,, 1500–0 m.
Scottocalanus securifrons (T. Scott)	,, 172	,, 820–0 m.
Lophothrix frontalis Giesbrecht	,, 131	,, 1500–0 m.
Amallothrix emarginata (Farran)	,, 172	,, 1500–0 m.
Disseta palumboi Giesbrecht	,, 131	,, 1500–0 m.

These parasites have a close resemblance to early stages in the development of *Ellobiopsis* (*vide* Chatton, 1920, and Steuer, 1928). In the great majority of instances the depth at which these examples were obtained was from hauls in 1500–0 m., the only exceptions being *Euchirella maxima*, from 450–0 m. and *Scottocalanus securifrons* and *Onchocalanus affinis*, from about 850–0 m.

Examples of Acinetids in various stages of growth were observed on the following species:

Euchœta marina (Prestandrea)	Sta. 61	depth 0 m.
E. wolfendeni A. Scott	,, 61	,, 0 m.
Gœtanus antarcticus Wolfenden	,, 61	,, 1500–0 m.
	,, 76	,, 2500–0 m.
G. curvicornis Sars	,, 61	,, 1500–0 m.
Scottocalanus dauglishi Sewell	,, 145	,, 500–0 m.

A number of species taken on the surface at Sta. 61 were found to be infected with examples of *Blastodinium*, and it is interesting to compare the list of these species with that given by Chatton (1920) of species from the Mediterranean Sea that were infected by this parasite :

Mediterranean Sea (from Chatton)	Indian Ocean.
Calanus finmarchicus.	
	Canthocalanus pauper.
	Nannocalanus minor.
	Undinula darwini.
	Paracalanus aculeatus.
Paracalanus parvus	*P. parvus.*
	P. denudatus.
	Acrocalanus gracilis.
Clausocalanus arcuicornis.	*Clausocalanus arcuicornis.*
C. furcatus.	*C. furcatus.*
Pseudocalanus sp.	
Calocalanus styliremis.	*Calocalanus styliremis.*
	Eucalanus pileatus.
	E. subtenuis.
	Euchæta marina.
	E. media.
	E. wolfendeni.
Scolecithrix bradyi.	
Centropages sp.	
Temora stylifera.	
Acartia clausi.	
Oithona plumifera.	*Oithona plumifera.*
O. nana.	
O. simplex.	
	Oncæa clevei.
Oncæa media.	*O. media.*
O. minuta.	
	O. venusta.
	O. venusta var. *vanella.*
	Corycæus speciosus.
*Corycæus venustus.**	
	Corycella gibbula.
Corycella rostrata.	

Chatton's list contains 17 species and that from the Indian Ocean 21 ; six species are common to both lists. It is hoped that a full description of these parasites will be published later.

---

* The figure that Chatton gives of this species is not that of *venustus*, but may possibly be *Corycæus limbatus*.

List of Species.

CALANOIDA.

Family CALANIDÆ.

Genus Calanus Leach.
Calanus finmarchicus Gunnecrus.

Genus Nannocalanus Sars.
Nannocalanus minor (Claus) f. *major*.
,, ,, ,, f. *minor*.

Genus Calanoides Brady.
Calanoides patagoniensis Brady.

Genus Canthocalanus A. Scott.
Canthocalanus pauper (Giesbrecht).

Genus Neocalanus Sars.
Neocalanus gracilis (Dana).
N. robustior (Giesbrecht).

Genus Undinula A. Scott.
Undinula darwini (Lubbock).
U. vulgaris (Dana).

Genus Megacalanus Wolfenden.
Megacalanus princeps Wolfenden.
,, ,, var. *inermis* nov.

Genus Bradycalanus A. Scott.
Bradycalanus gigas sp. nov.
,, *typicus* A. Scott ? juv.

Genus Bathycalanus Sars.
Bathycalanus bradyi (Wolfenden).

Family EUCALANIDÆ.

Genus Eucalanus Dana.
Eucalanus attenuatus (Dana).
E. pseudattenuatus sp. nov.
E. elongatus (Dana).
E. crassus Giesbrecht.
E. monachus Giesbrecht.
E. mucronatus Giesbrecht.
E. pileatus Giesbrecht.
E. subcrassus Giesbrecht.
E. subtenuis Giesbrecht.

Genus Rhincalanus Dana.
Rhincalanus cornutus Dana, f. *typicus* Schmaus.
R. nasutus Giesbrecht.

Family PARACALANIDÆ.

- Genus PARACALANUS Boeck.
  - *Paracalanus aculeatus* Giesbrecht.
  - *P. denudatus* Sewell.
  - *P. parvus* Giesbrecht.
- Genus ACROCALANUS Giesbrecht.
  - *Acrocalanus gracilis* Giesbrecht.
  - *A. longicornis* Giesbrecht.
  - *A. monachus* Giesbrecht.

Family PSEUDOCALANIDÆ.

- Genus CALOCALANUS Giesbrecht.
  - *Calocalanus pavo* (Dana).
  - *C. plumulosus* (Claus).
- Genus CLAUSOCALANUS Giesbrecht.
  - *Clausocalanus arcuicornis* (Dana).
  - *C. farrani* Sewell.
  - *C. furcatus* (Brady).

Family ÆTIDEIDÆ.

- Genus GÆTANUS Giesbrecht.
  - *Gœtanus antarcticus* Wolfenden.
  - *G. brevicornis* Esterly.
  - *G. curvicornis* Sars.
  - *G. kruppi* Giesbrecht.
  - *G. latifrons* Sars.
  - *G. miles* Giesbrecht.
  - *G. minor* Farran.
  - *G. pileatus* Farran.
- Genus EUCHIRELLA Giesbrecht.
  - *Euchirella bella* Giesbrecht.
  - *E. galeata* Giesbrecht.
  - *E. maxima* Wolfenden.
  - *E. orientalis* Sewell.
  - *E. pulchra* (Lubbock).
  - *E. truncata* Esterly.
  - *E. venusta* Giesbrecht.
- Genus CHIRUNDINA Giesbrecht.
  - *Chirundina indica* Sewell.
  - *C. streetsi* Giesbrecht.
- Genus PSEUDOCHIRELLA Sars.
  - *Pseudochirella magna* (Wolfenden).
  - ? *P. notacantha* Sars.
  - *P. obtusa* Sars.

Genus UNDEUCHÆTA Giesbrecht.

Undeuchæta bispinosa Esterly.
U. major Giesbrecht.

Genus PSEUDEUCHÆTA Sars.

Pseudeuchæta brevicauda Sars.

Genus VALDIVIELLA Steuer.

Valdiviella insignis Farran.
V. oligarthra Steuer.

Family EUCHÆTIDÆ.

Genus EUCHÆTA Philippi.

Euchæta consimilis Farran.
E. marina (Prestandrea).
E. media Giesbrecht.
E. murrayi sp. nov.
E. spinosa Giesbrecht.
E. tenuis Esterly.
E. wolfendeni A. Scott.

Genus PARAEUCHÆTA A. Scott.

Paraeuchæta bisinuata Sars.
P. hanseni (With).
P. investigatoris Sewell.
P. malayensis Sewell.
P. sarsi Farran.
P. scotti (Farran).
? *P. spinifera* Esterly.
P. tonsa Giesbrecht.
P. weberi A. Scott.
P. withi sp. nov.

Family PHÆNNIDÆ.

Genus XANTHOCALANUS Giesbrecht.

Xanthocalanus greeni Farran.

Genus ONCHOCALANUS Sars.

Onchocalanus affinis With.
O. trigoniceps Sars.

Family SCOLECITHRICIDÆ.

Genus SCOLECITHRICELLA Sars.

Scolecithricella pearsoni Sewell.
S. tenuiserrata (Giesbrecht).

Genus SCOTTOCALANUS Sars.
Scottocalanus dauglishi Sewell.
S. helenæ (Lubbock).
S. persecans (Giesbrecht).
S. securifrons (T. Scott).

Genus SCAPHOCALANUS Sars.
Scaphocalanus magnus (T. Scott), f. *major*.
,, ,, ,, f. *minor*.

Genus LOPHOTHRIX Giesbrecht.
Lophothrix frontalis Giesbrecht f. *major*.
,, ,, ,, f. *minor*.
L. humilifrons Sars.
L. quadrispinosa Wolfenden.

Genus AMALLOTHRIX Sars.
Amallothrix arcuata Sars.
A. emarginata (Farran).
A. gracilis Sars.
A. indica Sewell.

Family CENTROPAGIDÆ.
Genus CENTROPAGES Kröyer.
Centropages calaninus (Dana).
C. gracilis (Dana).
C. orsinii Giesbrecht.

Family PSEUDODIAPTOMIDÆ.
Genus SCHMACKERIA Poppe and Richard.
Schmackeria serricaudatus (T. Scott).
Genus PSEUDODIAPTOMUS Herrick.
Pseudodiaptomus salinus (Giesbrecht).

Family TEMORIDÆ.
Genus TEMORA Baird.
Temora discaudata Giesbrecht
T. turbinata (Dana).

Family METRIDIIDÆ.
Genus METRIDIA Boeck.
Metridia princeps Giesbrecht.

Genus PLEUROMAMMA Giesbrecht.
Pleuromamma abdominalis (Lubbock).
P. indica Wolfenden.
P. quadrungulata (F. Dahl).
P. xiphias (Giesbrecht).

Genus Gaussia Wolfenden.
- *Gaussia princeps* (T. Scott).

Family LUCICUTIIDÆ.

Genus Lucicutia Giesbrecht.
- *Lucicutia bicornuta* Wolfenden.
- *L. challengeri* Sewell.
- *L. flavicornis* (Claus).
- *L. magna* Wolfenden.

Family HETERORHABDIDÆ.

Genus Heterorhabdus Giesbrecht.
- *Heterorhabdus abyssalis* (Giesbrecht).
- *H. spinifrons* (Claus).

Genus Heterostylites Sars.
- *Heterostylites longicornis* (Giesbrecht).

Genus Hemirhabdus Wolfenden.
- *Hemirhabdus grimaldii* (Richard).
- *H. truncatus* (A. Scott).

Genus Mesorhabdus Sars.
- *Mesorhabdus angustus* Sars.

Genus Disseta Giesbrecht.
- *Disseta palumboi* Giesbrecht.

Family AUGAPTILIDÆ.

Genus Haloptilus Giesbrecht.
- *Haloptilus acutifrons* (Giesbrecht).
- *H. chierchiæ* (Giesbrecht).
- *H. mucronatus* (Claus).
- *H. ornatus* (Giesbrecht).
- *H. oxycephalus* (Giesbrecht).
- *H. validus* Sars.

Genus Euaugaptilus Sars.
- *Euaugaptilus angustus* Sars.
- *E. bullifer* (Giesbrecht).
- *E. digitatus* Sars.
- *E. elongatus* Sars.
- *E. facilis* (Farran).
- *E. grandicornis* Sars.
- *E. indicus* Sewell.
- *E. laticeps* Sars.
- *E. latifrons* Sars.
- ? *E. longicirrhus* Sars.

- *E. longimanus* Sars.
- *E. magnus* (Wolfenden), f. *fungiferus* Steuer.
- *E. nodifrons* Sars.
- *E. oblongus* Sars.
- *E. penicillatus* Sars.
- *E. tenuispinus* Sars.

Genus AUGAPTILUS Giesbrecht.
- *Augaptilus longicaudatus* (Claus).

Genus CENTRAUGAPTILUS Sars.
- *Centraugaptilus horridus* (Farran).

Family ARIETELLIDÆ.

Genus ARIETELLUS Giesbrecht.
- *Arietellus giesbrechti* Sars.
- *A. plumifer* Sars.
- *A. simplex* Sars.

Genus PHYLLOPUS Brady.
- *Phyllopus impar* Farrar.
- *P. muticus* Sars.

Genus PACHYPTILUS Sars.
- *Pachyptilus eurygnathus* Sars.
- *P. lobatus* Sars.

Genus HETEROPTILUS Sars.
- *Heteroptilus acutilobus* Sars.

Family CANDACIIDÆ.

Genus CANDACIA Dana.
- *Candacia æthiopica* (Dana).
- *C. bipinnata* Giesbrecht.
- *C. bispinosa* (Claus).
- *C. curta* (Dana).
- *C. longimana* (Claus).
- *C. pachydactyla* (Dana).
- *C. simplex* Giesbrecht.
- *C. varicans* Giesbrecht.

Family PONTELLIDÆ.

Genus CALANOPIA Dana.
- *Calanopia elliptica* (Dana).

Genus LABIDOCERA Lubbock.
- *Labidocera acuta* (Dana).
- *L. acutifrons* (Dana).
- *L. detruncata* (Dana).
- *L. minuta* Giesbrecht.

Genus Pontella Dana.
Pontella fera Dana.
P. securifer Brady.

Genus Pontellopsis Brady.
Pontellopsis armata (Giesbrecht).
P. perspicax (Dana).
P. regalis (Dana).

Genus Pontellina Dana.
Pontellina plumata Dana.

Family ACARTIIDÆ.

Genus Acartia Dana.

Sub-genus *Acanthacartia* Steuer.
Acartia (*Acanthacartia*) *pietschmani* Pesta.

Sub-genus *Odontacartia* Steuer.
Acartia (*Odontacartia*) *amboinensis* Carl.
A. (*O.*) *erythræa* Giesbrecht.

CYCLOPOIDA.

Section Gnathostoma.

Family OITHONIDÆ.

Sub-family Oithoninæ.

Genus Oithona Baird.
Oithona attenuata Farran.
O. brevicornis Giesbrecht.
O. fallax Farran.
O. nana Giesbrecht.
O. oculata Farran.
O. plumifera Baird.
O. rigida Giesbrecht.
O. setigera (Dana).

Section Pœcilostoma.

Family ONCÆIDÆ.

Genus Oncæa Philippi.
Oncæa clevei Früchtl.
O. conifera Giesbrecht.
O. media Giesbrecht, f. *major*.
,, ,, f. *minor*.
Q. mediterranea Claus.
O. venusta Philippi, f. *typica*.
,, ,, f. *vanella* Farran.

- Genus LUBBOCKIA Claus.
    - *Lubbockia aculeata* Giesbrecht.

Family SAPPHIRINIDÆ.

- Genus SAPPHIRINA Thompson.
    - *Sapphirina angusta* Dana.
    - *S. bicuspidata* Giesbrecht.
    - *S. iris* Dana.
    - *S. nigromaculata* Claus.
    - *S. metallina* Dana.
    - *S. opalina* Dana—*darwini* Haeckel.
    - *S. ovato-lanceolata* Dana—*gemma* Dana.
    - *S. sinuicauda* Brady.
    - *S. stellata* Giesbrecht.

- Genus COPILEA Dana.
    - *Copilia hendorffi* Dahl.
    - *C. lata* Giesbrecht.
    - *C. mediterranea* (Claus).
    - *C. mirabilis* Dana.
        - ,, ,, f. *platyonyx* Lehnhofer.
    - *C. quadrata* Dana.
    - *C. vitrea* (Haeckel).

Family LICHOMOLGIDÆ.

- Genus PACHYSOMA Claus.
    - *Pachysoma tuberosum* Giesbrecht.

Family CORYCÆIDÆ.

- Genus CORYCÆUS Dana.
    - Sub-genus *Corycæus* M. Dahl.
        - *Corycæus* (*Corycæus*) *crassiusculus* Dana.
        - *C.* (*C.*) *speciosus* Dana.
    - Sub-genus *Urocorycæus* M. Dahl.
        - *Corycæus* (*Urocorycæus*) *longistylis* Dana.
    - Sub-genus *Ditrichocorycæus* M. Dahl.
        - ? *Corycæus* (*Ditrichocorycæus*) *africanus* F. Dahl.
        - *C.* (*D.*) *asiaticus* F. Dahl.
        - *C.* (*D.*) *lubbocki* Giesbrecht.
    - Sub-genus *Onychocorycæus* M. Dahl.
        - *Corycæus* (*Onychocorycæus*) *agilis* Dana.
        - *C.* (*O.*) *catus* F. Dahl.
        - *C.* (*O.*) *pacificus* F. Dahl.
        - *C.* (*O.*) *pumilus* M. Dahl.

Sub-genus *Corycella* Farran.
Corycæus (*Corycella*) *gibbulus* Giesbrecht.

HARPACTICOIDA.

Family ECTINOSOMIDÆ.

Genus Ectinosoma Boeck.
Ectinosoma melaniceps Boeck.

Genus Microsetella Brady and Robertson.
Microsetella norvegica (Boeck).
M. rosea Dana.

Family TACHIDIIDÆ.

Genus Enterpina Norman.
Enterpina acutifrons (Dana).

Family MACROSETELLIDÆ.

Genus Macrosetella A. Scott.
Macrosetella gracilis (Dana).
M. oculata (Sars).

Genus Miracia Dana.
Miracia efferata Dana.

Family CLYTEMNESTRIDÆ.

Genus Clytemnestra Dana.
Clytemnestra rostrata (Brady).
C. scutellata Dana.

Family PONTOSTRATIOTIDÆ.

Genus Ægisthus Giesbrecht.
Ægisthus aculeatus Giesbrecht.
Æ. mucronatus Giesbrecht.

In a previous paper (Sewell, 1929–1932) I was able to record from the northern part of the Indian Ocean as many as 17 species that up to that time had not been recorded from any region other than the Atlantic Ocean or the Atlantic section of the Antarctic, namely :

Bathycalanus richardi Sars.
Spinocalanus magnus Wolfenden.
Monacilla tenera Sars.
Gaidius minutus Sars.
Pseudochirella cryptospina Sars.
P. notacantha Sars.
P. magna (Wolfenden).
Valdiviella minor Wolfenden.
V. oligarthra Steuer.
Onchocalanus trigoniceps Sars.
Lophothrix quadrispinosa (Wolfenden).
Scaphocalanus affinis Sars.
Amallothrix arcuata (Sars).
Mesorhabdus angustus Sars.
Euaugaptilus latifrons Sars.
E. tenuispinus Sars.
Pontoptilus ovalis Sars.

Among the present collections there are as many as 21 other species that up to the present time have not been recorded beyond the Atlantic Ocean, namely :

Bathycalanus bradyi Wolfenden.
Gœtanus curvicornis Sars.
Pseudeuchœta brevicauda Sars.
Paraeuchœta hanseni (With).
P. scotti (Farran).
P. withi sp. nov. (*sarsi* With, non Farran).
Xanthocalanus greeni Farran.
Lophothrix humilifrons Sars.
Haloptilus validus Sars.
Euaugaptilus digitatus Sars.
E. elongatus Sars.
E. grandicornis Sars.
E. longicirrhis Sars.
E. longimanus Sars.
E. penicillatus Sars.
Arietellus giesbrechti Sars.
A. plumifer Sars.
Phyllopus muticus Sars.
Pachyptilus eurygnathus Sars.
P. lobatus Sars.
Heteroptilus acutilobus Sars.

Such a comparatively large number of deep-sea species that are common to the Atlantic and Indian Oceans, but are at present unknown from any other region, indicates that there either is or has been a close connection between these two regions. Formerly (*vide* Alcock, 1898) this resemblance between the two faunas was attributed to the existence in early Tertiary times of the Tethys Sea, but I (*vide* Sewell, 1940) in a previous paper have suggested that the real explanation is to be found in the trend of the deep currents at the present day. I hope in a subsequent part of this paper to deal with the geographical distribution of the pelagic Copepoda.

SYSTEMATIC ACCOUNT.

Family Calanidæ.

Genus *Calanus* Leach.

Calanus, Giesbrecht, 1892, p. 88 ; Giesbrecht and Schmeil, 1898, p. 13.

Calanus finmarchicus Gunnerus.

Calanus finmarchicus, Giesbrecht, 1892, p. 89, pl. vi, fig. 19, pl. vii, figs. 32, 33, pl. viii, figs. 3, 15, 20, 21, 31, 33 ; Sars, 1903, p. 9, pls. i–iii ; With, 1915, p. 11, figs. 1–5.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 male.

Distribution.—This species is very widely distributed throughout the Pacific and Atlantic Oceans. Ekman (1935, p. 407) sums up its range as extending from New Zealand as far south as 52°–53° S., south-east of Australia, Fiji, the Indo-Malayan region (Sulu Sea), Hong Kong, the Gulf of California, the West coast of South America, in the warm regions of the Atlantic, and extending as far northwards as the east coast of Greenland in 78° N., also in the Mediterranean Sea and the Black Sea ; in the Indian Ocean off South Africa and in the Red Sea. This reference to the Red Sea is taken from Farran's paper (1911), but in a letter to me Dr. Farran admits that the inclusion of the Red Sea in the range of distribution was an error of transcription.

Calanus finmarchicus has a wide vertical range, extending from the surface to a depth of some 2000 fathoms and, as is to be expected, an equally wide range of temperature, having been taken alive in temperatures ranging from 2·0° to 22·0° C., and in salinity ranging from $29{\cdot}0^{\circ}/_{\circ\circ}$ to $35{\cdot}5^{\circ}/_{\circ\circ}$ (*vide* Farran, 1911, and Ruud, 1929), and even $36{\cdot}76^{\circ}/_{\circ\circ}$ (*vide* Cleve, 1903).

The extreme rarity of this species in the Indian Ocean is a matter for considerable surprise. Further to the East Brady (1918) has recorded the species off Maria Island, Tasmania, and Farran (1929) has recorded its frequent occurrence from New Zealand southwards to Auckland and Campbell Islands, while in Melbourne Harbour it was common; but no examples were taken by the " Siboga " Expedition in the Malay Archipelago, nor by the Expedition to the Great Barrier Reef of Australia. To the west the species has been taken off the east side of Cape Colony at Port Shepstone at a depth of 900 m. (Cleve, 1904), and Brady has recorded its capture in Lat. 35° 9′ S., Long. 45° 30′ E., in or very near the northern portion of the West Wind drift; but no examples have ever been taken by the " Investigator " in the Laccadive Sea, the Bay of Bengal, or the Andaman Sea, nor is the species represented in any other collection from the northern part of the Indian Ocean or the Red Sea. It would thus appear probable that on extremely rare occasions individuals may be carried from the Atlantic Ocean round the Cape of Good Hope in the North Atlantic Intermediate water or the West Wind Drift, and then get caught up in the Sub-Polar Intermediate current, and so get carried northwards into the Arabian Sea.

Genus *Nannocalanus* Sars.

Nannocalanus, Sars, 1925, p. 9.

Nannocalanus minor (Claus). (Text-fig. 1, A, B.)

Calanus minor, Giesbrecht, 1892, p. 90, pl. vi, figs. 3, 16, 22, pl. vii, figs. 6, 22, pl. viii, figs. 1, 9, 19, 30; Wolfenden, 1906, p. 995, pl. xcvii, figs. 36–38.
Nannocalanus minor, Sars, 1925, p. 9; Sewell, 1929, p. 21, figs. 2 and 3.

OCCURRENCE:

Sta. 56, South coast of Arabia, surface; 1 male.

Sta. 61 C, Northern area of Arabian Sea, surface; numerous examples: 1500–0 m.; 5 females, 2 males; 2000–0 m., 9 females, 1 male, 1 juv. The few examples in the nets from deep water were almost certainly captured in higher levels while the net was being hauled.

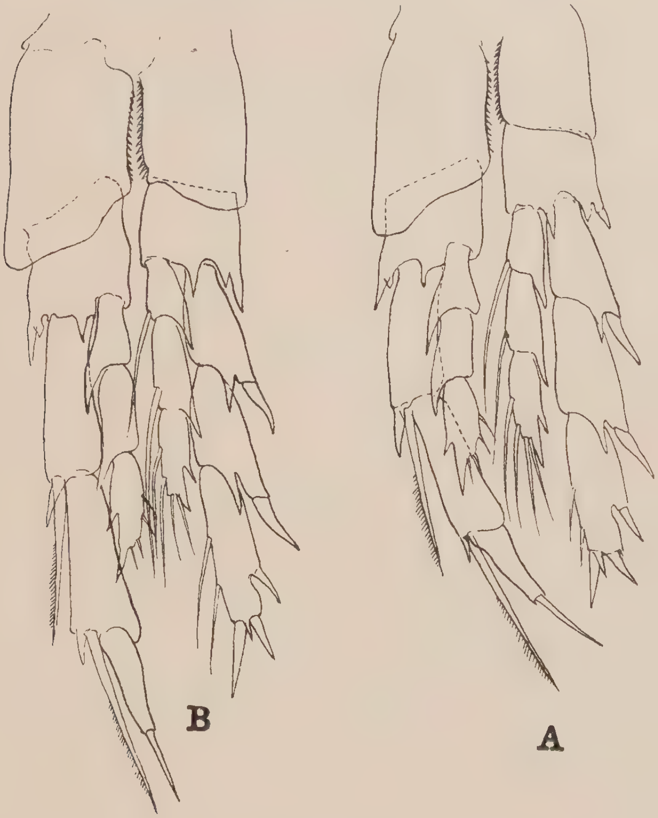
DESCRIPTIVE NOTES.—In a previous paper (Sewell, 1929, p. 20) I have recorded the occurrence in the same tow-netting of two forms of the female of this species, differing in the main only in size. These I termed f. *major* and f. *minor* respectively. The same two forms of the female are present in the collection from Sta. 61 C, and in addition there are a number of males that also appear to form two distinct size groups. The sizes of these groups are as follows:

Forma *major*:
Female; length ranging from 1·800–2·133 mm., average 1·974 mm.
Male; ,, ,, 1·666–1·800 ,, ,, 1·734 ,,

Forma *minor*:
Femlae; length ranging from 1·538–1·817 mm., average 1·726 mm.
Male; ,, ,, 1·533–1·666 ,, ,, 1·597 ,,

The proportional lengths of the various segments of the 1st antenna show slight differences in the two forms of the male, very similar to those seen in the two forms of the female, as is shown in the following table:

Segment	1–2.	3–5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
f. *minor*	125	75	25	22	20	20	25	28	33	42	44	47	47	50	53	56	50	47	53	58	58	22	= 1000
f. *major*	126	77	27	25	21	21	27	33	37	43	46	47	48	48	49	50	46	46	50	56	56	21	= 1000



Text-fig. 1.—The 5th pair of legs of the male. a, *Nannocalanus minor* f. *minor*. b, *Nannocalanus minor* f. *major*.

The mouth-parts and swimming legs appear to be identical, and I am unable to discover any marked difference in the 5th pair of legs in the two forms, though certain small differences are noticeable (*cf*. Text-fig. 1, a and b).

Distribution.—This species has a wide distribution throughout the tropical and temperate regions of all three oceans, Pacific, Indian and Atlantic, and ranges from about 33° N. in the Atlantic to 50° S. in the Pacific Ocean. It also appears to have a considerable range of depth distribution ; it is usually a surface form, but Wilson (1932, p. 23) records it in the Woods Hole Region of the American coast from depths of 1500 fathoms (2743 metres).

Genus *Calanoides* Brady.

Calanoides patagoniensis Brady.

Calanoides patagoniensis, Brady, 1883, p. 75, pl. xxiii, figs. 1–10 ; Giesbrecht, 1892, p. 91, pl. vi, figs. 8, 10, 17, pl. viii, fig. 29 ; Giesbrecht and Schmeil, 1898, p. 16 ; Farran, 1929, p. 215.

Occurrence :

Sta. 45, South coast of Arabia, depth 38 m. ; 1 juv.

Sta. 76, Gulf of Oman, 600 m. depth ; 3 juv. ; 1500 m. depth ; 2 juv.

Sta. 172, Central part of Arabian Sea, 850–0 m., 1 juv. ; 2081–0 m., 2 juv.

Descriptive Notes.—Unfortunately none of these examples is fully mature, the most advanced being in the 5th Copepodid stage. The forehead is rounded without any trace of the projection that is present in *Calanoides brevicornis* ; the posterior thoracic margin is somewhat acutely rounded and closely resembles the figure given by Giesbrecht (1892, pl. vi, fig. 17).

The marginal spine on the outer border of the 3rd segment of the exopod in swimming legs 2–4 divides this margin in the following proportions in the several legs :

2nd leg, 21 : 17.
3rd leg, 26 : 19.
4th leg, 27 : 18.

These proportions are much closer to those given by Giesbrecht and Schmeil (1898, p. 16) for *Calanus patagoniensis* (Brady) than to those for *C. brevicornis* Lubb.

Although these specimens are immature, I have little doubt that they belong to the above species.

Distribution.—Pacific Ocean, west coast of South America (Brady, Giesbrecht), Gulf of Oman and Arabian Sea (present records), and Atlantic Ocean, off Rio de Janeiro (Farran).

Tanaka (1937, p. 251) has recorded the occurrence of *Calanoides brevicornis* (Lubbock) from a depth of 500–250 meters off the coast of Heda, Sizuoka-ken. This example was an immature female, and in the rounded forehead, without any trace of a forward projection, and the rather pointed postero-lateral margins, closely resembles the present examples. It seems probable that this Japanese specimen was in reality an example of *Calanoides patagoniensis*.

Genus *Canthocalanus* A. Scott.

Canthocalanus pauper (Giesbrecht).

Calanus pauper, Giesbrecht, 1892, p. 91, pl. vi, fig. 4, and pl. viii, fig. 25 ; Wolfenden, 1906, p. 995, pl. xcvii, figs. 29–35.
Canthocalanus pauper, A. Scott, 1909, p. 9 ; Sewell, 1929, p. 25.

Occurrence :

Sta. 56, Southern Arabian Coast, surface ; 3 specimens.

Sta. 61 C, Northern area of Arabian Sea, surface ; numerous examples.

Distribution.—This species is widely distributed throughout the Pacific and Indian Oceans ; it has also been recorded from the Mediterranean Sea (Thompson and A. Scott, 1903, p. 241), but up to the present time has not been obtained from the Atlantic Ocean. It would thus seem probable that this species has made its way into the Mediterranean Sea from the Red Sea through the Suez Canal, though Gurney (1927) only records it from Suez Bay and the southern end of the Canal.

Genus *Neocalanus* Sars.

Neocalanus gracilis (Dana).

Calanus gracilis, Giesbrecht, 1892, p. 90, pl. i, fig. 1, pl. vi, fig. 1, pl. vii, fig. 26, and pl. viii, figs. 2, 4, 6–8, 12, 16, 26 ; v. Breemen, 1908, p. 10, fig. 7.
Megacalanus gracilis, A. Scott, 1909, p. 12.
Neocalanus gracilis, Sars, 1925, p. 7.

Occurrence.— Sta. 131 D, Southern area, Arabian Sea, 500–0 m., vertical haul ; 9 females, 1 juv.

Descriptive Notes.—The length of the immature form, which was in the 5th Copepodid stage, was 2·509 mm. The nine adult females exhibited a range of total length from 3·036 mm. to 3·309 mm., the average being 3·159 mm.

In this species, according to Giesbrecht and Schmeil (1898, p. 18) the external marginal spine divides the outer margin of the 3rd segment of the exopodite of the 2nd–4th swimming legs in the proportions 1 : 1, 4 : 3 and 4 : 3 ; in the present specimens this spine divides the margin of this segment in all the legs in the following proportions :

Exopod 3 of P. 1, 20 : 15.
,, ,, P. 2, 34 : 35, or 1 : 1·03.
,, ,, P. 3, 53 : 35, or 4 : 2·64.
,, ,, P. 4, 65 : 33, or 4 : 2·03.
,, ,, P. 5, 45 : 25.

Distribution.—This species has a wide range both horizontally and vertically. It has been taken in the Pacific Ocean in the San Diego region of the Californian coast (Esterly) and at several stations off the west coast of America and through the tropical region (Giesbrecht), off the Philippine Islands and in the Torres Straits (Giesbrecht), outside the Great Barrier Reef, and off New Zealand (Farran), and in the Malay Archipelago (A. Scott). In the Indian Ocean from Nankauri Harbour, Nicobar Islands (Sewell), off Minikoi (Thompson and A. Scott), the central and southern areas of the Arabian Sea (present records) and off the coasts of Natal and Cape Colony, but not south of the Agulhas Bank (Wolfenden). In the Atlantic Ocean it has been recorded from the Gulf of Guinea (T. Scott), the Canary Islands (Thompson), throughout the tropical and temperate regions (Giesbrecht, Farran), the Woods Hole region of the American coast (Wilson), to the south-east of Greenland (Jespersen), and as far north as 52° N. (Thompson), off the south-west of Ireland (Farran), in the Bay of Biscay (Farran), and in the Mediterranean Sea (Giesbrecht, Claus, Thompson, Cleve, Pesta).

Its vertical range extends from the surface, where it appears occasionally, down to 2688 m., but the depth limit appears usually to be in the region of 1000 m., and Farran states that most of the examples taken in the Bay of Biscay below this depth were dead.

Neocalanus robustior (Giesbrecht).

Calanus robustior, Giesbrecht, 1892, p. 91, pl. vii, figs. 15, 19, 25, 30, pl. viii, fig. 34 ; Wolfenden, 1906, p. 996, pl. xcvi, figs. 1–6.
Megacalanus robustior, A. Scott, 1909, p. 13.
Neocalanus robustior, Sars, 1925, p. 8.

Occurrence.—Sta. 131 D, Southern area, Arabian Sea, 500–0 m., 2 females, 3 juv. ; 1500–0 m., 6 females.

Descriptive Notes.—♀. Total length ranges from 3·67 to 3·93 mm.

Distribution.—In the Pacific Ocean from the San Diego region of the Californian coast (Esterly) and from the west coast of America to 175° W. between the Equator and 20° N. (Giesbrecht), and in the Malay Archipelago (A. Scott). In the Indian Ocean from the Maldive and Laccadive Archipelagoes (Wolfenden), off Minikoi (Thompson and A. Scott), and the southern area of the Arabian Sea (present record). In the Atlantic Ocean throughout the temperate region, generally at considerable depths (Sars), and between Lats. 30° N. and 18° S. (Farran).

Rose (1929, p. 8) states that this species in the Atlantic is taken at least four times more frequently in deep water than at the surface, and exhibits a well-marked diurnal migration, rising towards the surface at night.

Genus *Undinula* A. Scott.

Undinula darwini (Lubbock).

Calanus darwini, Giesbrecht, 1892, p. 91, pl. vi, fig. 5, pl. vii, fig. 29, pl. viii, figs. 11, 37; Wolfenden, 1906, p. 994, pl. xcvii, fig. 40.
Undinula darwini, A. Scott, 1909, p. 17; Sewell, 1929, p. 42, figs. 11, 12.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 2000–0 m., 3 females, 2 juv. (probably caught while the net was being hauled).
Sta. 61 C, Northern area of Arabian Sea, surface, numerous examples.
Sta. 131 D, Southern area of Arabian Sea, 850–0 m., 1 female.

Descriptive Notes.—I have in a previous paper (Sewell, 1929) called attention to the variation that is found in the shape of the posterior process of the left side of the 5th thoracic segment; among the present examples the common form is that which I have termed var. *intermedia*, though a few examples of the typical form are also present.

Remarks.—Two examples, both females from Sta. 61, present a very interesting abnormality. In both cases the two 1st antennæ were of approximately equal length, that on the right side measuring 2·05 and 2·08 mm. and that on the left 2·00 and 2·10 mm. in total length respectively; but whereas the right antennule was normal and consisted of the full 25 segments, segments 8 and 9 being fused, the appendage of the left side in each specimen consisted of only 18 segments, segments 8 and 9 being fused. The proportional lengths of the segments in the two appendages are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
(1) Right .	59	77	30	28	30	28	28	54	32	32	39	44	45	45	45	47	49	49	39	41	44	44	39	29	= 1000.
Left .	54	74	34	34	36	39	41	88	52	52	66	66	76	79	76	68	68	—	—	—	—	—	—	—	= 1000.
(2) Right.	52	72	30	28	30	28	30	53	34	36	41	47	47	47	47	47	51	49	40	41	41	43	38	28	= 1000.
Left .	51	80	32	30	34	34	37	77	50	54	67	75	77	77	75	73	77	—	—	—	—	—	—	—	= 1000.

Gurney (1931, p. 43) has pointed out that in the case of *Eurytemora*, which possesses 24 free segments, 24 and 25 being fused, at the moult from the last naupliar stage to the 1st copepodid stage the segments of the 1st antenna increase from 3 to 9 as follows :

Nauplius.	1st Copepodid.
Segment 1	Segment 1.
,, 2	Segments 2 and 3.
,, 3	,, 4–9.

In subsequent moults these terminal six segments (representing segments 19–25) do not undergo further subdivision, the preceding 18 segments being derived from Segments 1 and 2 of the Nauplius or 1, 2 and 3 of the 1st Copepodid stage. A similar change is carried out in *Calanus finmarchicus*, as has been shown by Lebour (1916); in this species the 1st antenna in the naupliar stages is composed of 3 free segments, and in the moult to the 1st Copepodid stage this number increases to 10, of which the distal 6 presumably correspond to segments 19–25, segments 24 and 25 in this case being separate. It thus appears probable that the above abnormal condition is due to the loss in a nauplius stage of the terminal segment of the 1st antenna, either from injury or, possibly, as a mutation, with the resulting reduction in the total number of segments in the final stage to 18, but with a compensatory increase in the length of each individual segment. In one specimen the 3rd segment of the exopod of the 3rd leg on the left side was also absent, the ramus consisting of only 2 segments.

A number of specimens are infected with a parasite that appears to be *Blastodinium contortum* Chatton (*vide* Chatton, 1920, p. 175).

The breeding season appears to have been in full swing in the month of November at Sta. 61, for out of 100 adult females, selected at random, 35 were bearing spermatophores. It would seem that in this species there is no attempt on the part of the male to implant the spermatophore in the region of the vulva and, on the contrary, the selected site appears to be the dorsum of the thorax in the 3rd or 4th segments, as is indicated in the following Table :

Spermatophore	on the	dorsum of thoracic segment iii	14 cases.
,,	,,	junction of segments iii and iv	4 ,,
,,	,,	dorsum of thoracic segment iv	14 ,,
,,	,,	junction of segments iv and v	1 case.
,,	,,	dorsum of thoracic segment v	2 cases.

DISTRIBUTION.—In the Pacific Ocean through the tropical region (Giesbrecht), off the Great Barrier Reef (Farran) and in the Malay Archipelago (A. Scott). In the Indian Ocean the species has been taken off the coast of Southern Burma (Sewell), in Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (Thompson and A. Scott, Pesta, present records), the Gulf of Aden and the Red Sea (A. Scott), the east coast of Africa (Thompson), the Agulhas Current (Cleve). In the Atlantic Ocean it has been reported from the tropical region (Lubbock) and from the North Atlantic (Brady).

Undinula vulgaris (Dana).

Calanus vulgaris, Giesbrecht, 1892, p. 92, pl. vi, fig. 11, pl. vii, figs. 2, 24, 27, 28, pl. viii, figs. 13, 17, 35; Wolfenden, 1906, p. 994, pl. xcvii, fig. 39.
Undinula vulgaris, A. Scott, 1909, p. 16; Sewell, 1929, p. 3, figs. 5–8.

OCCURRENCE:

Sta. 61 C, northern area of Arabian Sea, surface, several examples.
Sta. 136, Maldive area, surface, juv. stage II, 15, stage III, 18.
Sta. 172, central area of Arabian Sea, 200–0 m., 1 male adult, 1 juv.; 850–0 m., 1 female (probably caught while the net was being hauled).

DISTRIBUTION.—The temperate and tropical waters of all three oceans, especially between 20° N. and 20° S. of the Equator, but according to Wilson it may extend as far north as Lat. 41° in the Atlantic Ocean.

Family MEGACALANIDÆ.

I propose the creation of a new Family to accommodate the three genera, *Megacalanus* Wolfenden, *Bathycalanus* Sars and *Bradycalanus* A. Scott. Hitherto these genera have been included in the Family Calanidæ, but they exhibit a very close relationship to each other, as is very clearly demonstrated by the confused synonymy lists of the several species (*vide* Farran, 1939), while differing in several features from all other members of the Calanidæ, and show a corresponding resemblance to the Centropagidæ. Most workers have regarded the genus *Calanus* as the most primitive of all the Calanoida, but Gurney (1931, p. 83) remarks: "The Calanidæ appear to be more nearly related to the Centropagidæ than to the other members of the Amphascandria, and one would suggest that a more natural arrangement would be to place the Centropagidæ in the position now occupied by the Calanidæ as the most primitive family."

Unfortunately the male of the genus *Bradycalanus* is still unknown, but tentatively one can give the following characters as features distinguishing the Megacalanidæ from the Calanidæ:

1. The presence of three marginal spines on the exopods of swimming legs 2–4.
2. The terminal spines on exopod 3 of the swimming legs are serrated on their outer margins. Although near the base of these spines the serrations are so closely set as to appear like a striated membrane, towards the tip of the spine the separate serrations become abundantly clear.
3. The right antenna of the male is modified into a grasping organ. I (1929, p. 27) called attention to the fact that in the males of *Megalanus princeps* Wolfenden (= *Megacalanus longicornis* (Sars)) this appendage in examples from the Bay of Bengal is modified to form a grasping organ, and Rose (1929) has shown that this is the condition in the male of *Bathycalanus rigidus* (Sars) (= *Bathycalanus princeps* (Brady)).
4. The 5th pair of legs is only slightly modified in the male. Both rami are three-jointed, and the 2nd segment of the exopod of the left leg bears a slightly modified seta on its inner border. This condition is known to be present in the males of *Megacalanus princeps* Wolfenden and in both *Bathycalanus princeps* (Brady) and *B. bradyi* (Wolfenden) (= *B. maximus* Wolfenden).

PACIFIC OCE

In addition to the presence of three spines on the outer margin of exopod 3 of the swimming legs 2–4, the Megacalanidæ present in the number of setæ on the lobes of the 2nd maxilla a feature that approximates to the condition found in the Centropagidæ. In the following table I have given the number of setæ on the various lobes of this appendage in various genera :

	Number of setæ on the lobes of Maxilla II.					
	Lobe 1.	2.	3.	4.	5.	6.
Calanidæ :						
Calanus *Nannocalanus* *Neocalanus* *Undinula*	6	3	3	3	4	2 and 2 small
Calanoides .	6	3	3	3*	4*	1 and 3 small
Megacalanidæ :						
Megacalanus .	5 and 1 small	3	3	3*	3* and 1 small	1 and 3 small
Bathycalanus .	6	3	3	3	3 and 1 small	1 and 3 small
Bradycalanus .	6	3	3	3	2 and 1 small	1 and 3 small
Centropagidæ :						
Centropages .	5	3	3	3	3 and 1 small	1 and 2 small

* One of these is a definite spine.

Farran (1939) has recently reviewed the present position of the nomenclature and synonymy of the various species that are included in the genera *Megacalanus* Wolfenden and *Bathycalanus* Sars. There seem to be very few definite characters on which one can rely for the separation of these two genera. Rose (1929, p. 13) in his key to the genera and species relies, among other characters, on the prehensile character of the right 1st antenna in the male, the absence of a retroverted spine on the 2nd basal segment of the 1st leg and the ribbon-like character of the setæ on the terminal segments of the 2nd maxilla, as serving to discriminate *Bathycalanus* from *Megacalanus*, but the first of these is, in my opinion, not reliable. Among the species of *Bathycalanus* Wolfenden (1911) has described the male of *Bathycalanus bradyi* (Wolfenden), but he made no mention of the prehensile nature or otherwise of the 1st antenna ; Rose (1929, p. 9) has, however, shown that in the male of *B. rigidus* Sars this appendage on the right side is definitely prehensile. On the other hand, the males of *Megacalanus princeps* Wolfenden have been described by Wolfenden, Sars and others, all of whom state that the antennules of the male are similar to those of the female and are thus non-prehensile ; yet every male examined by me (1929, p. 27) in the " Investigator " collections from Indian Seas showed a clearly prehensile right antenna, and Vervoort (1946) has confirmed this in males taken by the " Snellius " Expedition in the Dutch East Indies. The presence of a retroverted spine on the 2nd basal segment of the 1st leg is merely a specific character of *Megacalanus princeps* Wolfenden ; but even so is not always reliable, for in the " John Murray " collections there is a specimen that agrees in every other respect with *Megacalanus princeps* Wolfenden but in which this spine is conspicuous by its absence. The setæ arising from the terminal portion of the 2nd maxilla are in the genus *Bathycalanus* curled at the end, and are clad in a double row of dense, closely set spinules, giving a ribbon-like appearance to these structures; the corresponding setæ in the genus *Megacalanus* are armed with separate spinules and are not curled at the ends; in *Megacalanus sarsi* (Farran), *M. gigas* sp. nov. and *Bradycalanus typicus* A. Scott, however, these setæ are scythe-shaped, and are clothed in two rows of densely set spinules, that exactly recall the arrangement in *Bathycalanus*.

One character to which sufficient attention has not been paid in the past is the number of setæ that are present on the various lobes of the 1st maxilla; in the following table I have given the arrangement in different species of the two genera:

	Genus *Megacalanus.*		Genus *Bradycalanus.*			Genus *Bathycalanus.*		
	M. princeps Wolfenden, var. *inermis*, nov.	*M. princeps* Wolfenden.	*B. gigas* sp. nov.	*B. sarsi* (Farran).	*Bradycalanus typicus* A. Scott.	*B. richardi* Sars and *B. bradyi* Wolfenden.	*B. princeps* (Brady).	*B. medius* (Wolfenden).
Le. 1 . . .	9	9	9	9	9	9	9	7
Le. 2 . . .	1	1	0 or 1	1	1	1	1	0
Re. . . .	11	11	10 or 11	11	9	11	11	11
Li. 1 . . .	14	12	15	12	13	11	10	10
Li. 2 . . .	5	4	5*	3	2	0	0	0
Li. 3 . . .	4	5	2	3	?	2	2	2
B. 2 . . .	4	4	4	3	4	3	2	2
Ri. 1 . . .	3	3	2	2	2	2	2	2 (?1)
Ri. 2 . . .	4	4	1	1	1	1 or 2	1	1 (?2)
Ri. 3 . . .	7	6 or 7	6*	5	5	6 or 7	4 or 5*	5*

* One seta quite small.

It seems clear from the above that the genus *Bathycalanus* is distinguished by the total absence of any setæ arising from the 2nd inner lobe, whereas in the genus *Megacalanus* the number ranges from 3 to 5. A comparison of the number of setæ on the different parts of the appendage in different species of *Megacalanus* shows that *M. princeps* Wolfenden can be distinguished from other members of the same genus by the presence of four setæ on the 2nd segment of the endopod; in *Bradycalanus gigas* sp. nov. and *M. sarsi* (Farran) there is only a single one, and the same is true of *Bradycalanus typicus* A. Scott, if we can rely on A. Scott's figure (1909, pl. i, fig. 5).

Attention has already been called to the minute sense organs, "maculæ cribrosæ," that occur on the appendages of this species (*vide* With, 1915, and Sewell, 1929). In the present specimens I have again carefully examined a specimen of *Megacalanus princeps* Wolfenden, and in the Table below I have given a complete list of these, and also of the similar sense organs in *Bathycalanus bradyi*. Up to the present time I have, however, completely failed to discover any such sense organs in either *Bradycalanus gigas* sp. nov., or in a young example of what I take to be *Bradycalanus typicus* A. Scott in the last copepodid stage.

	Megacalanus princeps.	*Bathycalanus bradyi.*
Antenna I, segment 2, upper surface	3	..
Antenna II, basal 2, upper surface	1	..
Endopod i, about $\frac{1}{5}$ from distal end	1	1
5th segment of exopod	1	1
Mandible, basal 1, near base of teeth	1	..
basal 2, near origin of exopod	1	1
1st Maxilla, basal 1, near base of Le 1,	1	1
lateral margin of exopod near base	1	..
2nd Maxilla, basal 1, anterior surface	1	1
lobe 4	..	1
Maxilliped, basal 2, anterior surface	1	1
endopod, segment 4	1	..
1st leg, basal 2, near origin of endopod	1	1
exopod 2, near base of spine	1	..
endopod 2, middle of segment	1	..
2nd leg, basal 1, near outer margin	1	..
basal 2, near origin of endopod	1	1
exopod 1, near base of spine	1	..
exopod 2, near base of spine	1	1
exopod 3, near base of 1st spine	1	1
near base of 2nd spine	1	1
endopod 2, middle of segment	..	1
3rd leg, basal 1	1	..
basal 2	1	..
exopod 1, near base of spine	1	1
exopod 2, near base of spine	1	1
exopod 3, near base of 1st spine	1	1
near base of 2nd spine	1	1
endopod 2	1	1
4th leg, basal 1	1	1
basal 2	1	1
exopod 1, near base of spine	1	1
exopod 2, near base of spine	1	1
exopod 3, near base of 1st spine	1	1
near base of 2nd spine	1	1
endopod 2	1	1
5th leg, basal 1	..	1
basal 2	1	1
exopod 1, near base of spine	1	1
exopod 2, near base of spine	1	1
exopod 3, near base of 1st spine	1	..
endopod 2	..	1
endopod 3	1	1

In addition to the " maculæ cribrosæ " which have been recorded from the various segments of the appendages there are several on the somites of the body. In *Megacalanus princeps* (Text-fig. 2, A) I have been able to detect four such organs on the ventro-lateral region of the Cephalon, a pair set obliquely from above downwards and backwards opposite the point of origin of the 2nd antenna, and a second pair, also set obliquely, opposite the point of origin of the 1st maxilla. On thoracic segment 1 in the ventro-lateral region near the posterior margin is a single " macula." On segments 2 and 3 in the ventro-lateral region there is a pair, set obliquely from above forwards and downwards, the anterior " macula " situated not far behind the overlapping border of the anterior segment and the posterior close to the posterior margin. Segment 4 possesses a single " macula " near the posterior margin. Similarly on the segments of the abdomen there seems to be a " macula " on the three anterior segments; thus in the female there is a pair on the lateral aspect of the genital segment (segments 1 and 2), the posterior being at a slightly higher level than the anterior, and on the 2nd free segment (segment 3) there is a single " macula " near the posterior margin. I have been unable to detect a macula on segment 4, but there is one in the dorso-lateral region, just posterior to the anal flap on segment 5; finally there is a single " macula " on the outer margin of the furcal ramus just proximal to the origin of the outermost furcal seta. The approximate positions of these body " maculæ " are shown in Text-fig. 2, A, but it must be noted that the size, as shown, is much too large.

KEY TO THE GENERA AND SPECIES OF MEGACALANIDÆ.

I. The rostral filaments are moderately slender and tapering; the exopod of the 1st leg bears 1, 1 and 2 external marginal setæ on the three segments; the 2nd inner lobe of the 1st maxilla bears from 2 to 5 setæ:

A. The 1st antenna is very long, nearly twice the length of the body, and over-reaches the furcal rami by about 8 segments; the 2nd segment of the endopod of the 1st maxilla bears 4 setæ; the setæ of the terminal part of the 2nd maxilla are armed with moderately spaced spinules; circular or oval " maculæ cribrosæ " are present . . . . *Megacalanus.*
  a. There is a hook on basal 2 of the 1st swimming leg . . . *Megacalanus princeps* Wolf.
  b. There is no hook on this segment . . . . *M. princeps* var. *inermis* nov.

B. The 2nd segment of the endopod of the 1st maxilla bears only 1 seta; the setæ of the terminal part of the 2nd maxilla are scythe-like and are densely ciliated; " maculæ cribrosæ " appear to be absent . . . . *Bradycalanus.*
  a. The 1st antenna is of moderate length and over-reaches the furcal rami by the last 4 or 5 segments:
    1. The posterior thoracic margin is rounded; total length, 11–12 mm. . *B. sarsi* (Farran).
    2. The posterior thoracic margin is produced in distinct points; total length 9 mm. *B. typicus* A. Scott.
  b. The 1st antenna is short, barely exceeding the length of the body; posterior thoracic margin is rounded; total length 14·9 mm. . . . . *B. gigas* sp. nov.

II. The rostral filaments are stout and sausage-like; the exopod of the 1st leg bears 0, 0 and 2 external marginal setæ on the segments; the 2nd inner lobe of the 1st maxilla is devoid of setæ; the setæ on the terminal part of the 2nd maxilla are ribbon-like and are densely clad with spinules; sensory organs resembling " maculæ cribrosæ " are present, but are arranged in a clump and not in an oval or ring *Bathycalanus.*

A. A pair of small spines on the forehead:
  a. Exopod of the 1st leg 2-jointed . . . . *B. bradyi* Wolfenden (= *B. maximus* Wolf.).
  b. Exopod of the 1st leg 3-jointed . . . . *B. richardi* Sars.

B. A longitudinal crest on the forehead . . . . *B. princeps* (Brady) (= *B. rigidus* Sars and *B. medius* (Wolf.)).

Genus *Megacalanus* Wolfenden.

Megacalanus, Wolfenden, 1904, p. 112 ; 1905, p. 1.
Macrocalanus, Sars, 1905*a*, p. 7 ; 1907, p. 3.
Megacalanus, Sars, 1925, p. 14 ; Rose, 1929, p. 11 ; Farran, 1939, p. 355.

At the present time this genus includes only a single species, *Megacalanus princeps* Wolfenden. This species is usually characterized by the presence on the 2nd basal segment of the 1st leg of a retroverted spine ; Wolfenden (1905) in his original definition of the genus makes no mention of this spine, and as he included in the genus a second species, *Megacalanus princeps* (Brady), later transferred to the genus *Bathycalanus* under the name *B. bradyi* (Wolf.), in which this spine is absent, he apparently did not consider it a generic character. A. Scott (1909, p. 12), however, considered this hook or spine to be a characteristic feature of the genus, for he writes, " I include under the genus *Megacalanus* only those Calanoids that have the anterior surface of the second joint of the basiopodite of the first pair of feet furnished with a strong hook as originally defined by Wolfenden." He thus included in this genus two other species, *Calanus gracilis* (Dana) and *C. robustior* (Giesbrecht) Sars (1925), removed these two species, and placed them together with *Calanus tenuicornis* Dana in a new genus *Neocalanus*. It thus seems clear that this spine must be regarded as an example of convergence and is not a generic character ; it seems doubtful whether it can even be regarded as a specific character, since in the John Murray Collection there is a specimen in which it is absent.

Megacalanus princeps Wolfenden. (Text-fig. 2, A–G.)

Megacalanus princeps (later emended to *M. bradyi*) Wolfenden, 1905*a*, p. 1, pl. i, figs. 1–6.
Megacalanus princeps, Wolfenden, 1911, p. 196, pl. xxii, figs. 1–11, text-fig. 1, *a*, *b* ; With, 1915, p. 41, pl. i, figs. 3, *a*–*i*, text-fig. 8, *a*–*d*.
Megacalanus longicornis, Sars, 1925, p. 11, pls. i, ii ; Sewell, 1929, p. 27.

OCCURRENCE :

Sta. 96, Central area of Arabian Sea, 390–635 m., 1 juv.
Sta. 98, Central area of Arabian Sea, 2800–0 m., 1 female.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female ; 1500–0 m., 2 females, 5 juv. ; 2500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 2 juv. ; 2091–0 m., 2 juv.

REMARKS.—The majority of these specimens appear to agree exactly with the previous accounts, but a single specimen showed an interesting abnormality.

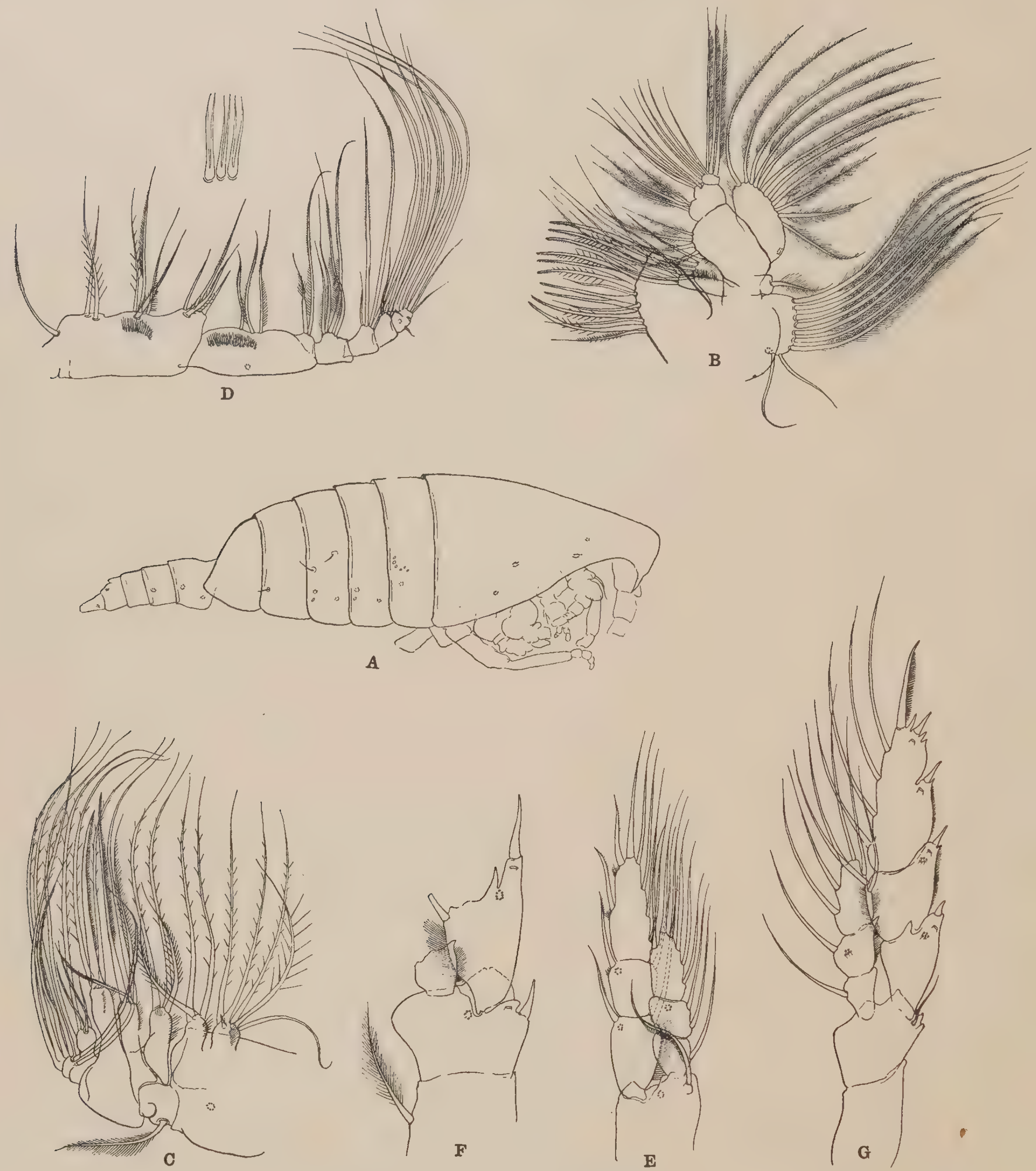
Abnormality : *inermis* nov.

OCCURRENCE.—Sta. 98, Central area, Arabian Sea, 2800–0 m., 1 female.

♀. Total length 8·73 mm.

The proportional lengths of cephalothorax and abdomen are as 75 to 25.

The posterior thoracic margin on each side is produced backwards and ends in a bluntly rounded prominence, that on the left side being more acutely rounded than on the right. The abdomen is composed of the normal four segments, having the following proportional lengths—41, 17, 13 and 12, the furcal rami being 17.



TEXT-FIG. 2.—*Megacalanus princeps* Wolfenden, var. *inermis* nov., ♀. A, Lateral view. B, 1st maxilla. C, 2nd maxilla. D, Maxilliped. E, 1st leg. F, Basal part of 2nd leg. G, 5th leg.

The 1st antenna is unfortunately broken, but the proximal 17 segments have the following proportional lengths :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.
	33	40	19	23	26	27	27	51	35	36	41	43	43	48	48	50

Segments 8 and 9 are fused and segments 13 and 14 are finely serrated along the distal half of the posterior margin, a character that was pointed out by Wolfenden, who stated that this armature was on segments 12 and 13, but presumably he counted the fused segments 8 and 9 as one.

The mouth-parts agree with those of a typical example. With (1915, p. 42) has called attention to the hairs (spinules) on the 2nd basal segment (according to his nomenclature B III) of the maxilliped, which he describes as being "bifurcate or divided into three branches" ; in the present specimen there was a line of simple spines along the base of this patch, and the remainder of the spinules were all bifurcate.

The 1st leg (Text-fig. 2, E) differs from that of the typical form by the absence of the characteristic spine on the anterior aspect of the 2nd basal segment. The other legs are similar to those in the typical form.

Distribution.—South and West of Iceland, 1000–1800 metres (With), North Atlantic Ocean, surface to 5700 metres (Sars), Biscayan region of the North Atlantic Ocean, 457–1892 metres (Farran), near Cape Verde Islands, 3000 metres (Wolfenden), Equatorial Atlantic Ocean, 800–3000 metres (Wolfenden), South Atlantic Ocean, 2450 metres (Wolfenden), South Indian Ocean—near the ice-edge—2450 metres (Wolfenden), Arabian Sea, 600–2800 metres (present records), Bay of Bengal, 732 metres (Sewell) and the Malay Archipelago, 1500 metres (A. Scott). With records it from 10 stations off Iceland, and Sars obtained it from no less than 43 stations in the central region of the North Atlantic ; judging from the depth distribution the species must be an inhabitant of the North Atlantic Intermediate water, and it seems probable that it has followed the general trend of movement of this great water mass and has been carried southward into the South Atlantic Ocean and then eastward round the Cape of Good Hope into the Indian Ocean, where, passing into either the sub-polar Intermediate current or the Antarctic bottom drift, it has been carried northwards to the Arabian Sea and the Bay of Bengal.

Genus *Bradycalanus* A. Scott.

Bradycalanus, A. Scott, 1909, p. 14.

A. Scott (*loc. cit.*) separates this genus from the closely related genus *Megacalanus* Wolfenden by the densely plumose character of the spines of the terminal part of the 2nd maxilla (1st maxilliped) and the absence of the hook on basal 2 of the 1st swimming leg, and from *Bathycalanus* Sars by the possession of three segments in the exopod of the 1st leg. Neither of these characters is reliable. Nevertheless, Farran (1939, p. 359) remarks, " I have also assumed the generic distinctness of *Megacalanus and Bradycalanus*" ; I agree with Farran, and it seems to me that there are certain, though perhaps slight, differences of character that are reliable :

1. The 2nd segment of the endopod of the 1st maxilla bears only 1 seta instead of 4 as in *Megacalanus*.

2. The spines on the terminal part of the 2nd maxilla are scythe-like and are densely plumose, instead of being armed with moderately widely-spaced spinules as in *Megacalanus* or ribbon-like as in *Bathycalanus*.

3. The exopod of the 1st leg is composed of three segments, the 1st and 2nd bearing one seta each on the outer margin and the 3rd 2 marginal setæ and an end-spine, as in *Megacalanus* ; whereas in *Bathycalanus* the marginal setæ on segments 1 and 2 are absent.

4. The rostral filaments are tapering as in *Megacalanus*, and not sausage or club-shaped as in *Bathycalanus*.

5. Cutaneous pores of the " maculæ cribrosæ " type appear to be absent.

If the above definition be accepted, this will necessitate the transference of the species *Megacalanus sarsi* Farran (*Megacalanus princeps* Sars (1925)) to the genus *Bradycalanus*.

Bradycalanus gigas sp. nov. Text-fig. 3, A, D.)

Occurrence.—Sta. 120, Zanzibar area, 2926 m., 1 female.

Descriptive Notes.—♀. Total length, 14·9 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 : 24.

The head and 1st thoracic segment are separate, as also are thoracic segments 4 and 5, The rostral filaments are short and stout, and are directed backwards ; they taper to a fine point, and immediately above their base is a small median papilla from which arise two minute sensory hairs. The forehead is rounded, the whole cephalothorax is robust and the posterior thoracic margins are rounded. The abdomen consists of the usual four segments, that have with the furcal rami the following proportional lengths :

Abdominal segment	1–2.	3.	4.	5.	Furca.
	48	19	11	6	16 = 100.

The genital segment is symmetrical and is somewhat swollen, anteriorly, on the ventral aspect.

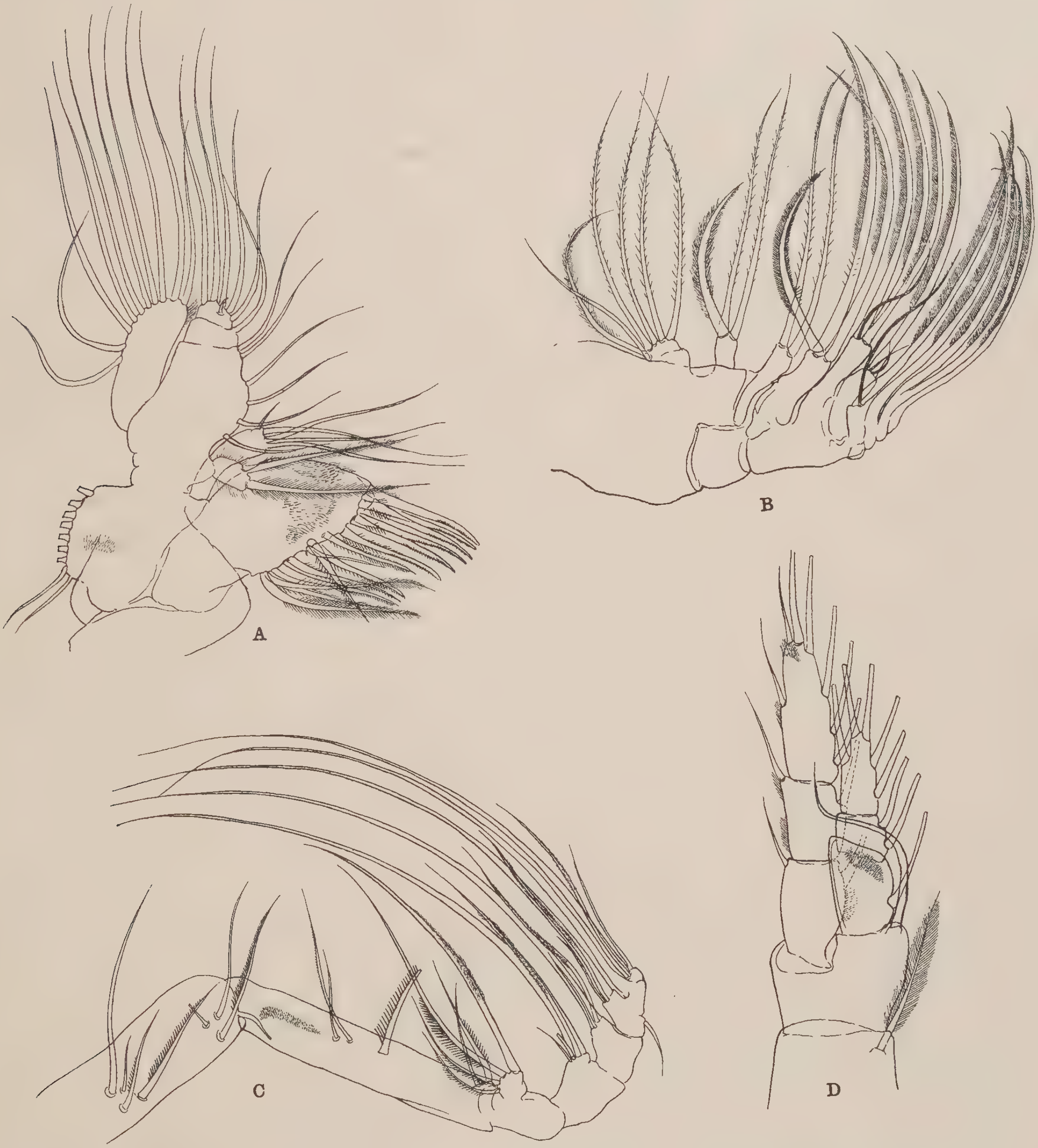
The 2nd furcal seta is unfortunately broken off on each side, but it is much stouter than the other furcal setæ.

The 1st antennæ are almost exactly equal in length to the whole body ; they consist of 25 segments having the following proportional lengths :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	61	58	24	25	26	26	26	25	26	33	35	41	51	53	59	59	60	59	59	41	39	37	33	17	27 = 1000

The 24th segment is relatively short, and both it and the 23rd segment bear a very stout and strong plumose filament, as in *Bradycalanus sarsi* (Farran).

The 1st maxilla (Text-fig. 3, A) differs from that of *Megacalanus princeps* Wolfenden, and resembles *M. sarsi* Farran in the reduced numbers of setæ arising from the distal segments of the endopod. The 1st inner lobe bears in all 15 spine-like setæ, of which those arising from near the base are fringed with hairs, while the more distal six are stout and strongly chitinised ; the anterior aspect of this lobe is clothed with short hairs. The 2nd lobe is long and curved and bears one short and four long setæ. The 3rd lobe is short and bears only two setæ. The 2nd basal segment and the 1st segment of the endopod are fused ; four setæ arise from the basal part and two from the distal inner angle of the portion that corresponds to the 1st segment of the endopod ; the 2nd segment of the endopod bears only a single seta ; the 3rd segment bears five setæ, and a short, curved, spine-like process arises from the anterior aspect of the segment. The exopod bears eight long setæ and a 9th appears to have been broken off ; and two shorter ones spring from the margin proximally, making 11 in all. The 1st outer lobe bears seven long setæ and two short ones proximally. The 2nd outer lobe is apparently without a seta.



Text-fig. 3.—*Bradycalanus gigas* sp. nov., ♀. A, 1st maxilla. B, 2nd maxilla. C, Maxilliped. D, 1st leg.

The 2nd maxilla (Text-fig. 3, B) is well developed. It agrees closely with the corresponding appendage of *M. sarsi* Farran (*vide* Sars, 1925, pl. iii, fig. 8). The 1st lobe bears 6 setæ ; the 2nd 3, of which one is stout and claw like ; the 3rd bears only 2 setæ, and the 4th 3, one of which and the other two scythe-like and closely fringed with hairs is claw-like ; the 5th lobe bears 3 setæ, one being small and the other two scythe-like ; the next lobe bears one scythe-like seta and a very small plain seta. From the endopodal portion of the limb arise five scythe-like setæ and one moderately small plain seta. All the scythe-like setæ are fringed with a very closely set row of fine hair-like spinules along the inner margin, as in *Bradycalanus typicus* A. Scott.

The maxilliped (Text-fig. 3, C) is of the usual Calanoid type and the setæ arising from the terminal segments are long and slender.

The 1st swimming leg (Text-fig. 3, D) closely resembles that of the form described by Sars under the name *Macrocalanus princeps* (Brady) (= *M. sarsi* Farran). The 1st basal segment bears a seta at its distal inner angle; the 2nd basal carries the usual S-shape seta at the distal inner angle and this arises from a small boss, but there is no hook-like spine as in *Megacalanus princeps* Wolfenden. The exopod consists of three clearly separated segments; of these the 1st and 2nd each bear an external marginal seta-like spine and an inner seta, the 3rd segment bears two marginal spines and an end-spine as well as four inner setæ; the proximal seta divides the outer margin into proximal and distal regions that have the relative lengths of 75 to 55. The endopod also consists of three segments, of which the 1st is by far the longest and the 2nd comparatively short; they have the proportional lengths of 98 : 35 : 72. Sars, in his figure of *Megacalanus princeps* (Brady), shows them as being nearly equal.

The 2nd–4th swimming legs all bear three marginal spines on the 3rd segment of the exopod.

The 5th swimming leg closely resembles that of *Bradycalanus sarsi* (Farran), as figured by Sars (1925, pl. iii, fig. 12).

REMARKS.—While closely resembling the form described by Sars under the name *Megacalanus princeps* (Brady), the present species differs from it in certain particulars, of which the most important are (1) the comparative shortness of the 1st antenna, which in the present species is only equal to the length of the whole body instead of exceeding this by one quarter of their length, and (2) the length of the 1st segment of the endopod of the 1st swimming leg, which is far longer than in Sars' form.

Bradycalanus sp., juv.

? Bradycalanus typicus, A. Scott, 1909, p. 14, pl. i, figs. 1–11.

OCCURRENCE.—Sta. 186, Gulf of Aden, 600–0 m., 1 juv. (Stage V).

DESCRIPTIVE NOTES.—Copepodid Stage V. Total length, 7·2 mm.

The head is rounded without any trace of a frontal crest, and the rostral filaments are moderately stout and are tapered and recurved. The posterior thoracic margins are produced backwards and are somewhat sharply rounded, and at the tip are produced into sharp points, exactly as A. Scott has described in *Bradycalanus typicus*, and as With (1915) p. 41, fig. 8, *d*) has figured for a young example of *Megacalanus princeps* Wolfenden.

The abdomen is composed of 4 segments that have the following proportional lengths:

Segment 1.	2.	3.	4–5.	Furca.
17	30	15	19	19 = 100

The 1st antenna must have over-reached the tip of the furcal ramus by about the last four segments. Segment 25 is unfortunately missing, but the other segments have the following proportional lengths :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14	15.	16.	17.	18.	19.
56	60	22	22	25	23	24	42	36	40	46	54	56	60	60	58	48	44

20.	21.	22.	23.	24.	25.	
32	32	44	44	28	(44)=	1000

Segments 7 and 8 are fused. Segments 3 to 7 inclusive bear a transverse row of setæ on their posterior aspects. Segment 24 is considerably shorter than segment 23, as in *Bradycalanus sarsi* (Farran) ; and segments 23 and 24 each bear a long stout and plumose seta.

In the 2nd antenna the endopod and exopod are of equal length.

The biting ramus of the mandible is powerful and is armed with 5 strong teeth, decreasing in size, 2 small pointed spines and a posterior, stout, spine-like process.

In the 1st maxilla the various parts bear the following setæ :

Le. 1	7 large and 2 small on one side and 5 large and 2 small on the other.
Le. 2	1
Re.	10
Li. 1	14
Li. 2	5
Li. 3	3
B. 2	4
Ri. 1	2
Ri. 2	1 large and 1 small.
Ri. 3	5 large and 1 small.

In the 2nd maxilla the number of setæ on the various lobes are as follows : on segment 1, on lobes 1 to 3, 6, 3 and 3 ; on segment 2 (lobe 4) 3, on endopod 1 (lobe 5) 3, one being distinctly stouter than the other two, on endopod 2 (lobe 6) 4, three being quite small, and on the terminal segments, 7, one quite small ; a plumose seta arises from the posterior margin of segment basal 2.

The maxilliped is of the usual shape and the number of setæ on the various segments is as follows : basal 1 bears 3, 4 and 4, basal 2, 3 and 2, endopod 1 and 2, 3 each, endopod 3 and 4, 2 each and endopod 5, 3. Endopod 4 also bears an outer seta.

In the 1st leg the 2nd basal bears an inner seta but there is no spine as in *M. princeps*. The segments of the exopod bear 1, 1 and 2 external setæ. The 2nd to 4th legs are as in the adult, each ramus being composed of three segments. The 5th leg is not yet fully developed, the rami possessing only two segments, segments 2 and 3 not yet having become differentiated. It is clear, however, that the terminal segment of the exopod will bear only 2 marginal spines in the adult stage.

Remarks.—In the shape of the posterior thoracic margins this specimen closely resembles *Bradycalanus typicus* A. Scott ; the total length of the specimen, namely 7·2 mm., agrees with what one would expect in the 5th Copepodid stage of this species, that has a total length in the adult stage of about 9 mm., as the growth factor would then be in the neighbourhood of 1·250 ; whereas with an adult measuring from 11 to 12 mm. as in *B. sarsi*

(Farran), the growth factor would have to be as high as 1·529–1·667. Still less is this example likely to be an immature stage of *B. gigas* sp. nov., which has a length of 14·9 mm.

Genus *Bathycalanus* Sars.

Bathycalanus, Sars, 1905*a*, p. 7, and 1925, p. 16.

At the present time this genus comprises three species, the correct names of which, according to Farran (1939), are *Bathycalanus richardi* Sars, *B. bradyi* (Wolfenden) and *B. princeps* (Brady). With (1915, p. 39) has already called attention to the presence in *Bathycalanus princeps* (Brady) on some of the swimming legs of sensory organs, similar to those present in the species *Megacalanus princeps* Wolfenden and named by him " maculæ cribrosæ." As With has pointed out, in *Bathycalanus princeps* these are less regular in number as well as in arrangement. With, however, did not in all probability detect the full series, and a careful study of a specimen of *Bathycalanus bradyi* (Wolfenden) has revealed several others. The full list of these organs that I have so far been able to detect is given above on p. 23 ; it must be noted, however, that in this genus these sense-organs do not exhibit the ring-form that is so characteristic of them in *Megacalanus*, but the small pores are arranged in clumps. Where present these clumps occupy the same, or very nearly the same, position on the various appendages and the body segments as in *Megacalanus princeps*.

Bathycalanus bradyi (Wolfenden). (Text-fig. 4, A–C.)

Megacalanus bradyi, Wolfenden, 1905, p. 3, pl. i, figs. 7–9.
Bathycalanus maximus, Wolfenden, 1911, p. 189, pl. xxiii, figs. 1–7, and text-fig. 2*a*, *b*.
(For the full synonymy, *vide* Farran, 1939.)

OCCURRENCE.—Sta. 76, Gulf of Oman, 2500–0 m., 1 female.

DESCRIPTIVE NOTES.—♀. Total length, 11·93 mm.

Wolfenden gives the lengths of his specimens as ranging from 10·9 to 12·0 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 to 24. The proportional lengths of the various segments of the body are as follows :

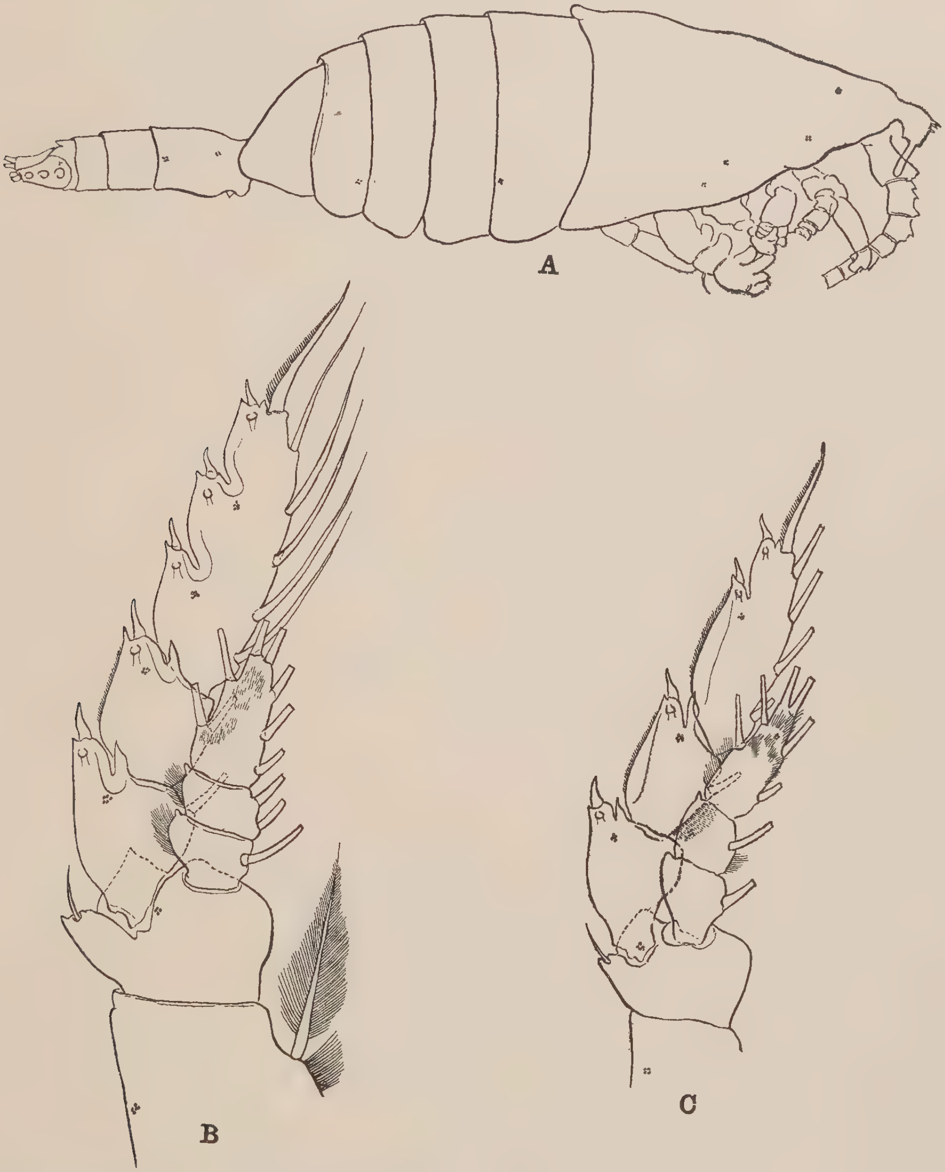
Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
360	107	73	66	53	79	100	69	45	13	35 = 1000.

The head (Text-fig. 4, A) is markedly tapered anteriorly and at the extreme anterior end is produced in a pair of short horns, immediately below which is a pair of small sensory hairs. On the posterior margin in the mid-dorsal line the cephalon is produced in a bluntly rounded eminence. The rostral processes are sausage-like. The five thoracic segments are separate and the posterior thoracic margin is rounded. Wolfenden (1911, p. 198) states that the two last thoracic segments are fused, but in the present example they are clearly separate, at any rate in the mid-dorsal line.

The abdomen is composed of four separate segments, of which the posterior or anal segment is very short.

I have been able to detect several " maculæ cribrosæ " on the body. On the cephalon in the dorso-lateral region there is one situated between the points of origin of the 1st and 2nd antennæ and a second is situated near the lateral border opposite the origin of the

2nd antenna. Opposite the origin of the 1st maxilla are two more situated near the lateral margin, the anterior being at a rather higher level than the posterior. A single macula is seen in the ventro-lateral region of the 1st and 3rd thoracic segments close to the posterior margin. The genital segment of the abdomen possesses a pair of maculæ, the anterior in line with the genital orifice and the posterior near the hinder margin. A single macula has also been seen on the furcal ramus just above the articulation of the outermost seta.



TEXT-FIG. 4.—*Bathycalanus bradyi* (Wolfenden), ♀. A, Lateral view. B, 4th leg. C, 5th leg.

Unfortunately both 1st antennæ are broken off.

The mouth-parts agree with the descriptions and figures given by Wolfenden (1911).

In the 1st swimming leg the exopod is clearly divided into three segments, of which the 1st and 2nd are devoid of a marginal spine. Wolfenden (1911, p. 199) states that "am Innenaste fehlen auch die ausseren Randborsten des 1. und 2. Gliedes," but this is clearly an error and it is the outer branch that he is referring to.

In the 2nd–4th pairs of legs (Text-fig. 4, B) both rami are composed of three segments, and the 3rd segment of the exopod bears 3 marginal spines. The distal segment of the endopod is thickly clad with hairs.

In the 5th leg (Text-fig. 4, C) the rami are also composed of 3 segments, but in this case there are only two marginal spines on the 3rd segment of the exopod.

REMARKS.—Sars (1925, p. 16) claims that this form is identical with that described by him under the name *Bathycalanus richardi*. I (1929, p. 31, 1932, pls. i and ii) have recorded the occurrence of Sars' species from the Bay of Bengal, these individuals clearly showing the characteristic fusion of the 2nd and 3rd segments in the exopod of the 1st leg in the female. Since this difference appears to be constant, it seems best, as Farran (1939, p. 359) has done, to regard the two forms as separate, though very closely related, species.

DISTRIBUTION.—An extensive area throughout the deep water of the Atlantic, north and south of the equator, from 1500 to 3000 metres' depth (Wolfenden); it would thus seem to be an inhabitant of the North Atlantic Intermediate water, and in all probability, like the preceding species, has been carried round the Cape of Good Hope into the Indian Ocean and then in the Antarctic Bottom Drift up into the Gulf of Oman.

Bathycalanus sp., juv. (Text-fig. 5, A–H.)

OCCURRENCE.—Sta. 131 D, Central area of Arabian Sea, 1500–0 m., 1 juv., copepodid stage V.

DESCRIPTIVE NOTES.—Total length, 7·9 mm.

The proportional lengths of the cephalothorax and abdomen are as 75 to 25. The proportional lengths of the various segments of the body are as follows:

Cephalothorax.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
346	104	95	78	53	74	42	70	49	49	40 = 1000

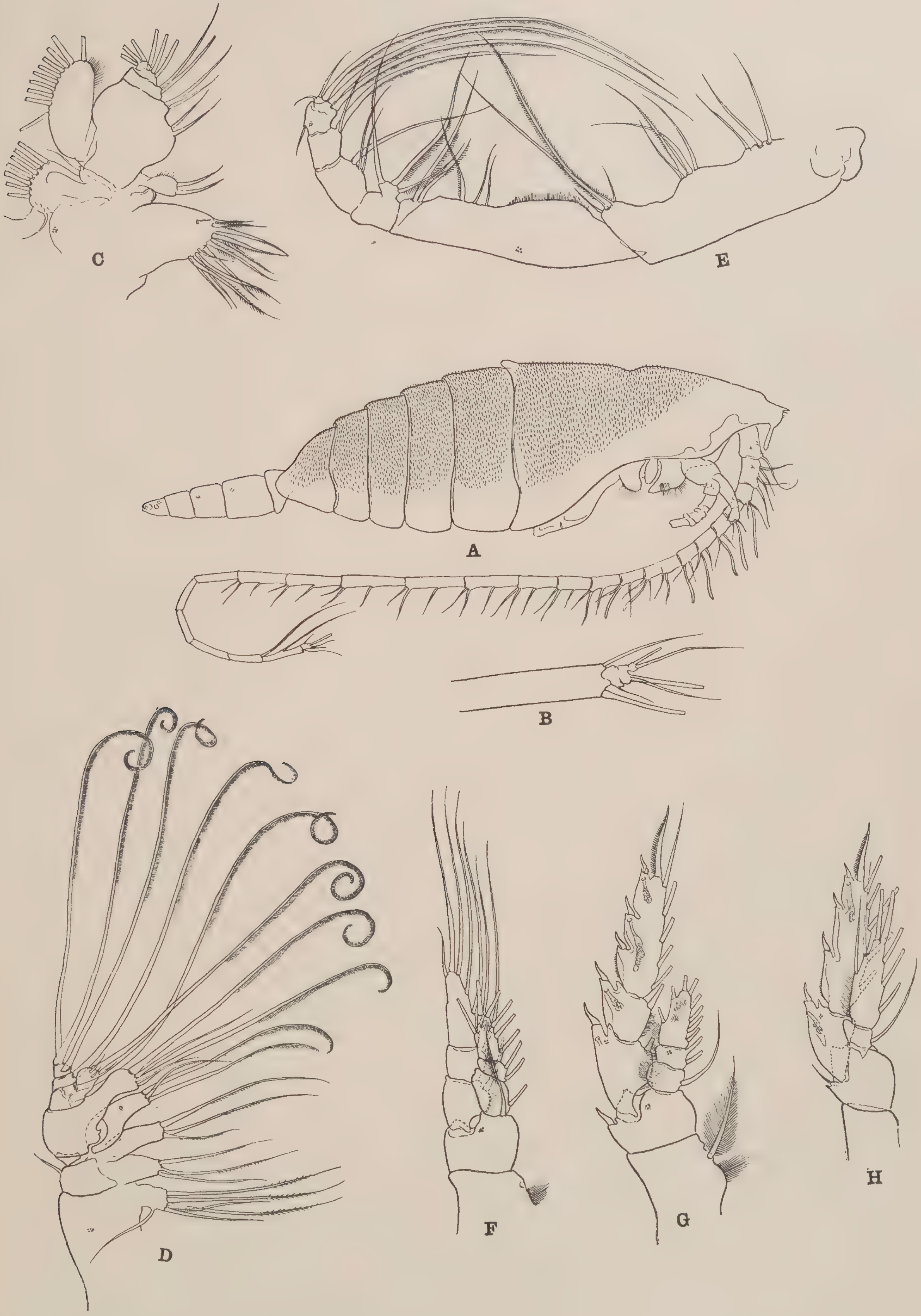
In the proportions and general shape of the body this young form (Text-fig. 5, A) closely resembles the adult *B. bradyi* (Wolfenden). The head rapidly tapers in front of the origin of the 1st antenna. The posterior margin of the cephalon is produced in the mid-dorsal line in a rounded protuberance. The 4th and 5th thoracic segments are separate, and the posterior thoracic margin is rounded. The dorso-lateral region of the cephalon in the posterior three-fourths of its length and of all the thoracic segments is ornamented with numerous short, raised ridges, that in the main run transversely. The rostrum resembles that of the adult, and consists of a pair of stout sausage-like organs without any terminal seta-like projections.

In the abdomen the 1st and 2nd segments are separate, but the 4th and 5th are still fused. I have been able to detect a single "macula" in the dorso-lateral region of the 2nd and 3rd abdominal segments, and another near the base of the outer furcal seta.

The 1st antenna over-reaches the tip of the furcal ramus by the last 5 or 6 segments. The proportional lengths of the segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
	42	27	16	18	24	23	21	17	21	29	29	37	47	54	57	60	62

18.	19.	20.	21.	22.	23.	24.	25.
67	69	47	50	54	52	27	50 = 1000.



Text-fig. 5.—*Bathycalanus* sp., Copepodid State V. A, Lateral view. B, Terminal portion of 1st antenna. C, 1st maxilla. D, 2nd maxilla. E, Maxilliped. F, 1st leg. G, 2nd leg. H, 5th leg.

The 8th and 9th segments are partially fused. The terminal portion of the end segment (Text-fig. 5, B) strongly supports the view that this segment is composed of several, probably three, segments fused together.

The mouth-parts resemble those of the adult (Text-fig. 5, C, D and E).

The 1st leg (Text-fig. 5, F) resembles that of *B. bradyi*, and differs from *B. richardi* in that the exopod is clearly composed of three separate segments.

The 2nd–4th legs (Text-fig. 5, G) possess the usual structure.

In the 5th leg (Text-fig. 5, H) both exopod and endopod are composed of only two segments, segments 2 and 3 not yet having separated.

REMARKS.—In spite of its relatively small size, as compared with the adult, it seems probable that this example is a young stage of *Bathycalanus bradyi* (Wolfenden). The presence of all three segments in the exopod of the 1st leg is a character that not only shows its affinity with *B. bradyi*, but also indicates that Rose (1929, p. 13) is wrong when he remarks, " Or Wolfenden observe 3 articles à l'exopodite de la 1re patte de *B. maximus* ♀, et c'est le charactère essentiel qui permettrait de séparer les 2 formes. En fait, il parait plus vraisemblable d'admettre que Sars n'a vu que des individus non complètement adultes, où la 1re patte présente encore des charactères larvaires."

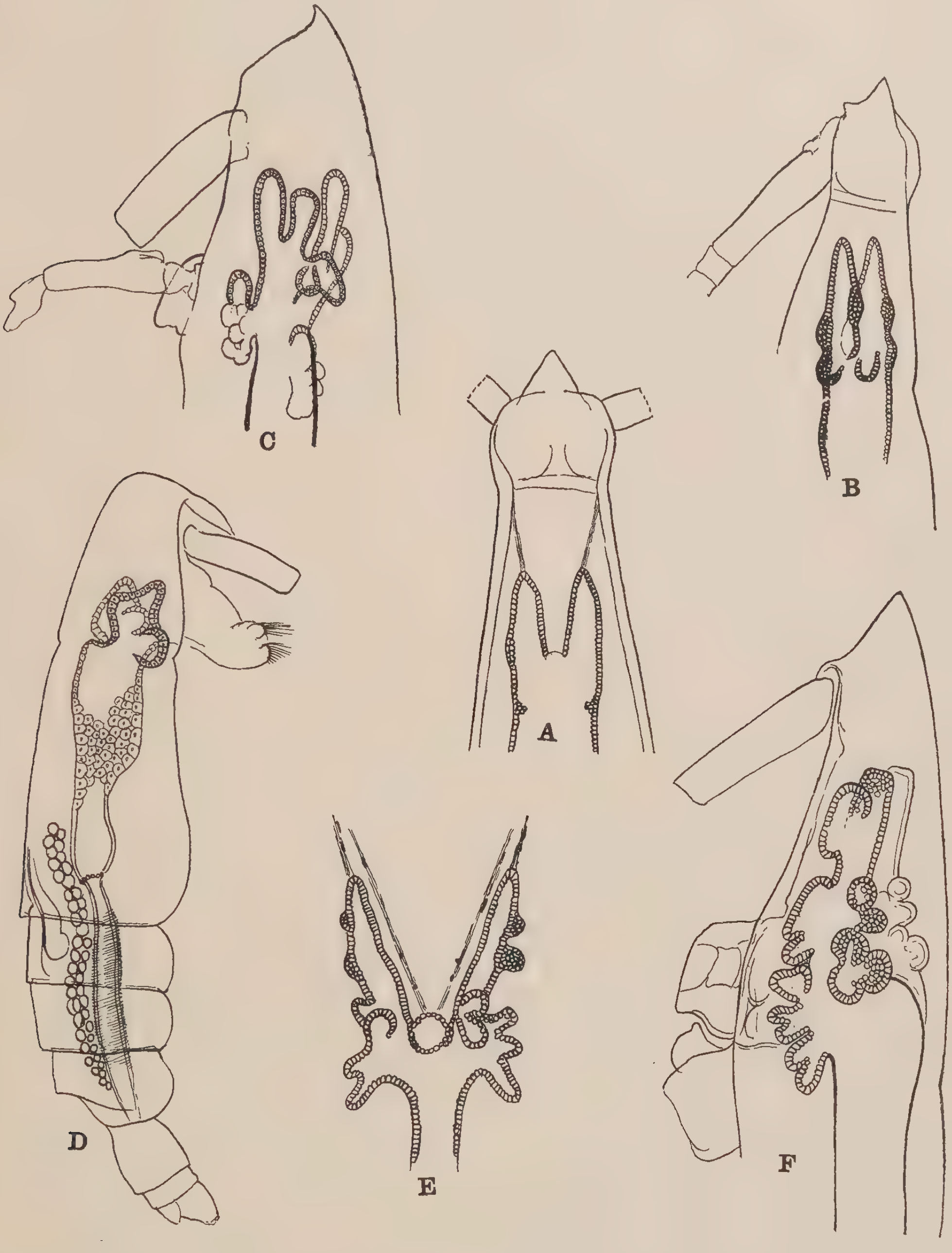
Family EUCALANIDÆ.

Genus *Eucalanus* Dana. (Text-fig. 6, A–F.)

Throughout this genus there is a steadily progressive development of the gastric cavity. Calman (1909, p. 92) states that " in many Gymnoplea there is a short median diverticulum anteriorly and, in some cases, immediately behind this a pair of small lateral (hepatic) cæca, which may be bifid (*Eucalanus*)." The simplest form of stomach that I have examined in this genus is to be found in the species *Eucalanus pseudattenuatus* sp. nov. (Text-fig. 6, A, B), in which there is a small, median, rounded diverticulum dorsally, and extending forward on either side of this is a simple digitiform diverticulum, the wall of which is composed of a single layer of cubical cells except at two points, one on the dorsal and the other on the ventro-lateral aspect, where the endothelium is thickened.

The next stage of development and the one which corresponds to the description given by Calman is reached in *Eucalanus crassus* and *E. subcrassus* (Text-fig. 6, D). With (1915, p. 53, pl. i, fig. 7) has described the cæcal diverticula arising from the anterior region of the gastric cavity in *Eucalanus crassus* as being " divided into smaller parts " ; in his figure he shows a short and broadly rounded, median diverticulum and, arising from the gastric cavity near the base of this, on either side, a larger diverticulum with a smaller one arising more posteriorly and projecting in the ventro-lateral direction. It thus would perhaps be more correct to say that in these species there is a median diverticulum and a pair of diverticula on either side, an antero-lateral pair and a ventro-lateral pair. In *Eucalanus subcrassus* the condition appears to be very similar, but the anterior paired diverticula are more pyriform than rounded, the narrow anterior end projecting forwards and downwards. In *Eucalanus mucronatus* (Text-fig. 6, C) the condition has become still more complicated. The median dorsal diverticulum is now bifid, and below and in front of this pair there is, on either side, an unequal pair of diverticula that project forwards ; these appear to correspond to the antero-lateral and ventro-lateral pairs of diverticula in

E. subcrassus. Still further back in the ventro-lateral region there is now a new development, having the appearance of a glandular mass, that is indistinctly tri-lobed, and of which the anterior part is produced in a small anteriorly-directed diverticulum.



Text-fig. 6.—The gastric cavity in A, *Eucalanus pseudattenuatus* sp. nov., dorsal view. B, *Eucalanus pseudattenuatus* sp. nov., oblique side view. C, *Eucalanus mucronatus*, side view. D, *Eucalanus subcrassus*, side view. E, *Eucalanus attenuatus*, Stage V, dorsal view. F, *Eucalanus attenuatus* adult, side view.

Finally, the greatest degree of complexity that, up to the present, I have been able to examine, is to be found in *Eucalanus attenuatus*. Claus (1863, p. 59) pointed out that the shape and evolution of the alimentary canal might change very considerably in a single species, and in this instance there is a marked increase in the complexity of the organ as we pass from Stage V in the female to the Adult Stage VI. In Stage V (Text-fig. 6, E) the condition present resembles somewhat the stage reached in *E. mucronatus*; there is a short, median diverticulum, and on either side of this a long, digitiform diverticulum runs forwards and outwards; the wall of this latter is thickened in two areas on the outer aspect. At the base of this antero-lateral diverticulum there is on each side a smaller diverticulum, single on the left side in the specimen examined but bifurcate on the right; this diverticulum appears to correspond to the ventro-lateral diverticulum of *E. crassus* and *subcrassus*. More posteriorly in the ventro-lateral region there is a more complicated diverticulum that appears to be subdivided into three smaller cæca. In Stage VI (Text-fig. 6, F) the thickened endothelial areas of the antero-lateral diverticula have now developed into secondary pouches, and at the proximal end of this diverticulum on the dorsal aspect a group of sudsidiary pouches has made its appearance and the posterior diverticulum in the ventro-lateral region has become still more complicated, for the posterior two cæca have themselves become bifid. We thus have a complicated structure that very markedly resembles the hepato-pancreas of the Malacostraca.

Eucalanus attenuatus (Dana). (Text-fig. 7, B.)

Eucalanus attenuatus, Giesbrecht, 1892, p. 131, pl. iii, fig. 1, pl. xi, figs. 1, 11, 13, 16, 18, 24, 40, pl. xxxv, figs. 3, 6, 17, 25, 34 and 37; van Breemen, 1908, p. 16, fig. 12 *a–d*; Sewell, 1925, p. 48; Vervoort, 1946, p. 95.

OCCURRENCE:

Sta. 61 C, Northern area of Arabian Sea, surface; 19 females, 7 males.
Sta. 76, Gulf of Oman, 600 m., 50 specimens.
Sta. 96, Central part of Arabian Sea, 645–400 m., 182 females, 119 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 6 females.
Sta. 172, Central part of Arabian Sea, 200–0 m., 2 females; 400–0 m., 217 females, 33 males; 850–0 m., 329 females, 144 males.
Sta. 186, Gulf of Aden, 500–700 m., 65 females, 74 males.

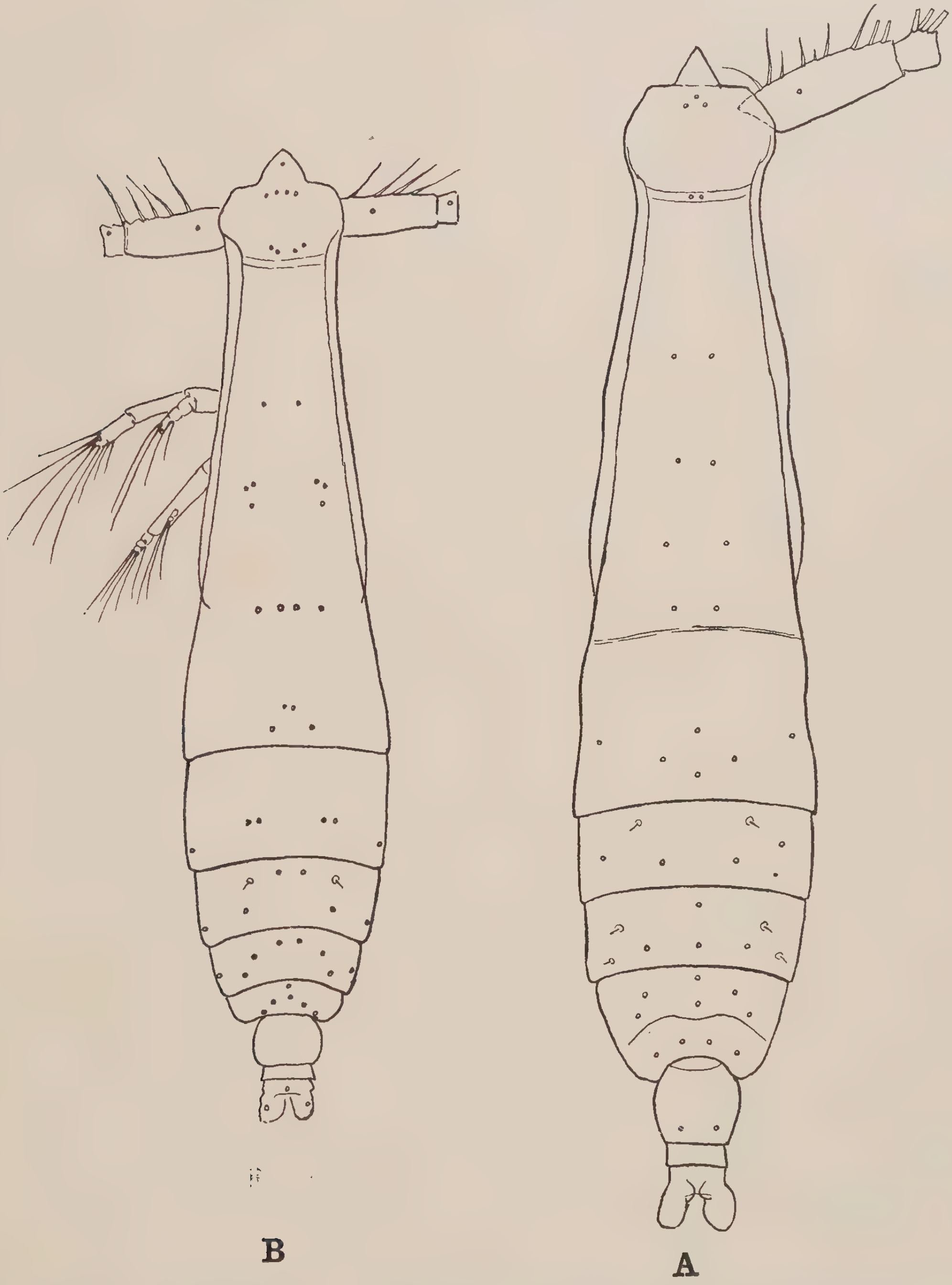
DESCRIPTIVE NOTES.—The present examples agree closely with the description given by Giesbrecht and others. In a few examples of mature females the genital segment is furnished in the postero-lateral regions with a group of small spinules.

The presence of glands, opening through small pores in the cuticle of the cephalothorax and abdomen, has been recorded in a number of species belonging to several genera and families from both fresh-water and marine habitats, and I have (1932) described the distribution of such pores in the following:

Family Temoridæ, Genus *Temora*.
,, Metridiidæ, Genera *Metridia*, *Gaussia* and *Pleuromamma*.
,, Heterorhabdidæ, Genera *Heterorhabdus*, *Hemirhabdus* and *Disseta*.
,, Lucicutiidæ, Genus *Lucicutia*.

A number of such pores are present in the above species, scattered over the head, thorax and abdomen, as shown in Text-fig. 7, B.

DISTRIBUTION.—This species possesses an extremely wide range occurring in all the great oceans. In the Pacific it has been recorded from the San Diego region (Esterly), the Pacific Ocean and China Sea (Dana), off New Zealand in lat., 34°–35° S. (Farran) and in the Malay Archipelago (Cleve, Vervoort); it is extraordinary that neither this species nor the closely related *Eucalanus elongatus* were recorded among the "Siboga" collections from the Malay Archipelago by A. Scott (1909). In the Indian Ocean it has been taken in the Moscos Archipelago off the coast of S. Burma, in the Bay of Bengal (Sewell, Menon), the Laccadive Sea (Sewell), from Ceylon to the Red Sea (Thompson and A. Scott), the Arabian



TEXT-FIG. 7.—The cutaneous pores in A, *Eucalanus pseudattenuatus* sp. nov. B, *Eucalanus attenuatus*.

Sea and the Gulf of Aden (present records), and off the African coast between Port Natal and Simonstown (Wolfenden), the Arabian Sea and Gulf of Aden (Cleve) and the Agulhas Current off South Africa (Cleve). In the Atlantic Ocean it occurs between 35° S. and 40° N. (Wolfenden), in the Gulf of Guinea (T. Scott), off S. America in lat. 30°–40° S. (Farran), at several stations in the North Atlantic (Sars, Rose), in the Mediterranean Sea (Claus, Rose), and off the Irish Atlantic slopes in lat. 55° N. (Farran). Thompson (1898) recorded it from the Faroe Channel, and Wolfenden (1902) also included it in the list of Copepoda taken in that locality; Fowler (1898 and 1903), relying on Thompson's identification, indicated that this species is an ingredient of both the Epi-plankton and the Meso-plankton. Wolfenden (1904) later came to the conclusion that the sample from the Faroe Channel in which this species had been found "had become contaminated with some material from the Indian Ocean" and that the only species from the Faroe Channel is the closely related *Eucalanus elongatus*.

The vertical distribution of this species appears to extend from 0 to 3000 fathoms (5486 m.). In the Indian Ocean its depth range appears to be considerably less, extending from the surface down to about 1250 metres, with a maximum intensity at about 400–800 metres. It has been recorded in water of salinity ranging from 36.27°/$_{\circ\circ}$ to 10·86°/$_{\circ\circ}$ in the Gulf of Oman and the Gulf of Guinea respectively.

The statement made by Wolfenden (1906, p. 996) that in the Maldive Archipelago this species "entirely replaces *E. elongatus* characteristic of the North Atlantic" is without foundation.

There appears to be a very considerable difference in the number of examples of this species that are present in different regions. In the following table I have given the total numbers captured in the eastern and western areas of the Arabian Sea:

Depth. (m.)	Affected area. Stas. 61 A and C, 76.	Unaffected area. Stas. 96, 172 and 186.
0–200	26	2
200–600	50	551
600–1000	0	612
1000–1500	0	0

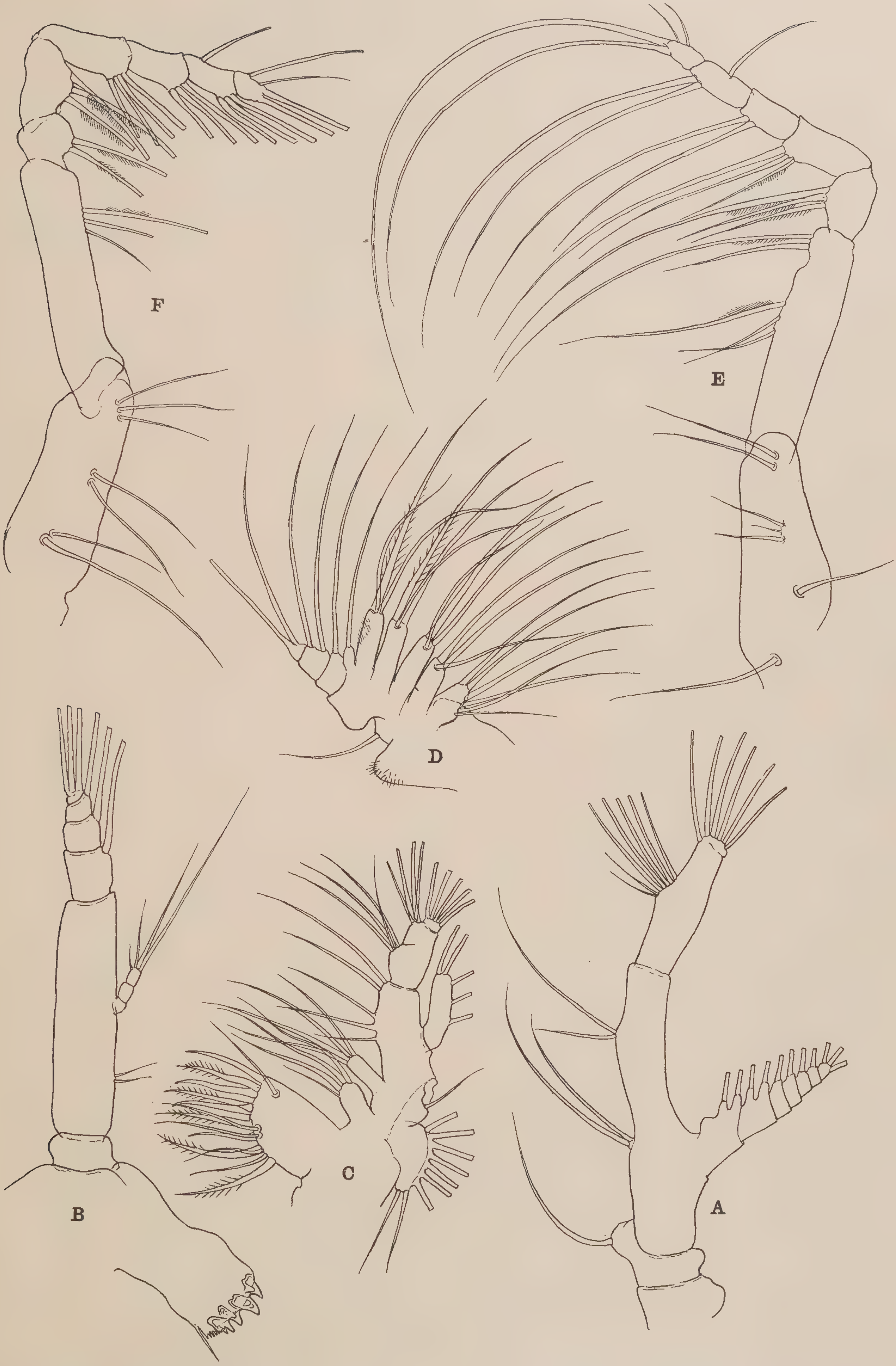
It thus seems clear that in the southern and central areas conditions are much more favourable than in the Gulf of Oman region, especially between 600–1000 metres depth.

Eucalanus pseudattenuatus sp. nov. (Text-fig. 7, A, and Text-fig. 8, A–F.)

Associated with the last species in the collections were numerous specimens that exhibit an extremely close resemblance, differing, in the main, in size but also showing certain slight anatomical differences.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 7 examples.
Sta. 61 C, Northern area of Arabian Sea, surface, 112 females, 3 males (adult), 9 males (Stage V); 1500–0 m., 15 specimens.
Sta. 96, Central area of Arabian Sea, 645–400 m., 4 specimens.
Sta. 145, Maldive area, 500–0 m., 1 specimen.
Sta. 172, Central part of Arabian Sea, 400–0 m., 5 specimens; 850–0 m., 7 specimens.



TEXT-FIG. 8.—*Eucalanus pseudattenuatus* sp. nov., ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, 2nd maxilla. E, Maxilliped, Stage V. F, Maxilliped, adult.

Descriptive Notes.—The total length of the females ranges from 3·00 to 3·383 mm. in Stage V, and from 3·318 to 4·250 mm. in the adult; in the males the length is 2·463 mm. at Stage V and 3·067 mm. at Stage VI.

♀. In its general form the body very closely resembles that of *Eucalanus attenuatus* (Dana), but the anterior region of the head is more markedly constricted in front of the attachment of the 1st antennæ, and the extreme anterior end is sharply pointed and is usually bent somewhat downwards. The cephalon and 1st thoracic segments are fused, but in stained specimens the line of junction is indicated by a narrow unstained line. Thoracic segments 4 and 5 are not completely separate, being fused together in the ventro-lateral region. The genital segment of the abdomen consists of the fused three anterior segments, and when viewed from the dorsal aspect is about as long as wide; ventrally it projects in a rounded swelling, bearing the genital aperture. Between the genital and anal segments is one free segment. The anal segment and furcal rami are fused. The 2nd seta on the left furcal ramus is markedly stouter and much longer than the others.

As in *E. attenuatus*, the external cuticle is pierced by a number of small pores, that open on the dorso-lateral region of the cephalon and thoracic segments, and on the dorsal region of the genital segment of the abdomen; the arrangement of these pores is shown in Text-fig. 7, A.

The 1st antenna consists of 23 separate segments, segments 1 and 2 and 8 and 9 respectively being fused. As in *Eucalanus attenuatus*, the terminal segment, 25th, is extremely long.

The proportional lengths of the individual segments are as follows, and for the purpose of reference I have also given those of the appendage in *E. attenuatus*:

Segment	1–2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
pseudattenuatus .	120	25	25	26	26	28	52	35	42	47	50	51	51	51	50	48	47	42	38	29	37	27	53	= 1000.
attenuatus . .	120	28	26	27	27	28	55	36	40	50	52	53	53	52	51	49	46	41	38	28	32	23	55	= 1000.

The 2nd antenna (Text-fig. 8, A) is similar to that of *E. attenuatus*.

The mandible (Text-fig. 8, B) closely resembles that of *E. attenuatus*; the exopod arises from near the middle of the 2nd basal segment and bears 4 setæ, of which the inner is long and the outer very short and delicate. Two small setæ spring from the inner margin of the 2nd basal segment about half way between the proximal end and the origin of the exopod.

The 1st and 2nd maxillæ (Text-figs. 8, C and D) appear to be identical with those of *E. attenuatus*.

The maxilliped (Text-fig. 8, E and F) exhibits differences in the Vth and VIth stages. As Lebour (1916) has shown in *Calanus finmarchicus*, the number of setæ arising from the 2nd, 3rd and 4th segments of the endopod is increased at this moult; the same is true of the present species:

	Segments of endopod	1.	2.	3.	4.	5.
Stage V:	Number of setæ	3	3	2	2(1)	2(2).
Stage VI:	,, ,,	3	4	3	3(1)	2(2).

The setæ shown in brackets arise from the outer margin.

The swimming legs are similar to those of *E. attenuatus.*

♂. Only four adult examples were obtained. In their general appearance these agree extremely closely, except as regards size, with the male of *E. attenuatus.* As in that species, the anterior region, instead of being acutely pointed, is rounded. The abdomen consists of four free segments and the combined anal segment and furcal rami.

There are a pair of legs present on the 5th thoracic segment, the right being comparatively short and being composed of only three segments, whereas the left is long and is composed of four segments. The terminal segment of each leg bears a single seta.

I have been in some doubt as to whether these smaller examples should be regarded as a distinct species, or merely as a depauperized form of *E. attenuatus.*

In previous papers I have shown that there is a gradual change in the proportions of the various parts of the body at each successive moult; in typical examples of *E. attenuatus* we get the following changes in the proportional lengths of each segment of the body as we pass from stage V to the adult Stage VI:

♀.	Cephalon and Th. segment I.	Thoracic segments.				Abdominal segments.		
		II.	III.	IV.	V.	I–III.	IV.	V + furca.
Stage V:	643	76	67	46	43	61	17	47
Stage VI:	612	85	73	53	49	62	19	47

In *E. pseudattenuatus*, however, the proportional lengths of the various segments of the body in the last two stages of development are as follows:

♀.	Cephalon and Th. segment I.	Thoracic segments.				Abdominal segments.		
		II.	III.	IV.	V.	I–III.	IV.	V + furca.
Stage V:	645	79	68	50	39	65	14	40
Stage VI:	645	72	66	50	38	63	19	47

Thus the relative length of the cephalon in this form approaches more nearly to that found in Stage V in the true *attenuatus*, but there is little or no difference in the proportional lengths of the abdominal segments.

In the two forms the average length measurements of the two last stages in the female and the corresponding growth-factors are as follows:

	Stage V.	Stage VI.	Growth-factor.
E. attenuatus	4·407 mm.	5·275 mm.	1·196
E. pseudattenuatus	3·298 ,,	3·838 ,,	1·164

In addition to these differences there are certain small differences in structure:

(i) The arrangement of the pores, opening on the cuticle, is different.

(ii) The head is more acutely pointed in *E. pseudattenuatus.*

(iii) The gastric cavity is of a simpler type in *E. pseudattenuatus* than in *E. attenuatus.*

In these circumstances it seems best to regard the two forms as representing different species.

Eucalanus elongatus (Dana).

Eucalanus elongatus, Giesbrecht, 1892, pp. 131, 148, pl. xi, figs. 2, 7, 12, 20, 25, 32, 36, pl. xxxv, figs. 1, 2, 13, 23, 24 ; van Breemen, 1908, p. 14, fig. 10 ; With, 1915, p. 48, pl. i, figs. 5 *a–d*, text-fig. 9 *a–f* ; Sewell, 1929, p. 48, fig. 13; Vervoort, 1946, p. 84.
Eucalanus atlanticus, Wolfenden, 1904, p. 113, pl. ix, figs. 3, 4.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 4 specimens ; 1500–0 m., 100 specimens.
Sta. 61 C, Northern area of Arabian Sea, 1000–0 m., 33 specimens ; 1500–0 m., 43 specimens ; 2000–0 m., 1 specimen.
Sta. 71, Gulf of Oman, 106 m. ; 3 females.
Sta. 76, Gulf of Oman, 200–0 m., 41 females, 10 males ; 600–0 m., 2061 females, 29 males ; 1500–0 m., 351 specimens.
Sta. 96, Central area of Arabian Sea, 645–400 m., 254 females, 4 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 3 females.
Sta. 145 C, Maldive area, 300–0 m., 8 females, 1 male ; 500–0 m., 2 males.
Sta. 145 D, Maldive area, 300–0 m., 1 female ; 500–0 m., 2 females.
Sta. 172, Central area of Arabian Sea, 200–0 m., 260 females, 3 males ; 400–0 m., 302 females ; 850–0 m., 556 females, 11 males.
Sta. 186, Gulf of Aden, 250–0 m., 191 specimens ; 575–0 m., 830 specimens ; 600–0 m., 2741 females, 8 males.

DESCRIPTIVE NOTES.—All the females examined belonged to the variety first described by Giesbrecht (1895, p. 246) and later noted by Esterly (1905, p. 132, fig. 6 b), in which the posterior lateral margin of the 5th thoracic segment is rounded and does not exhibit the small spine of the typical form. Both of these records come from the Pacific Ocean, and it would appear possible that this variety is in reality an Indo-Pacific form.

The outstanding feature of the collection is the great paucity of males as compared with the females, as is clearly shown in the table below :

	Females.	Males.
Sta. 76, depth 200 metres	41	10
Sta. 172, ,, 200 ,,	260	3
Sta. 172, ,, 400 ,,	302	0
Sta. 96, ,, 645–400 metres	254	4
Sta. 76, ,, 600 metres	2061	29
Sta. 186, ,, 600 ,,	2741	8
Sta. 172, ,, 850 ,,	556	11
Totals	6215	65

In every case that I have examined the male is in the last Copepodid stage—Stage V—and agrees exactly with the male described by Wolfenden (1904, p. 113, figs. 3 and 4) from the Atlantic Ocean under the name *Eucalanus atlanticus*; no mature males were found.

DISTRIBUTION.—The species has a wide range. It has been recorded in the Pacific

Ocean at several stations off the west coast of South America from Valparaiso northwards (Giesbrecht), and from the San Diego region (Esterly); on the west side of this ocean it has been taken in Long, 132° W. between lats. 14° N. and 3° S. (Giesbrecht); it is common off New Zealand as far south as 62° 41′ S. (Farran), and also occurs off the Australian Barrier Reef (Farran), and in the Malay Archipelago (Vervoort).

In the Indian Ocean it occurs round the Nicobar Islands (Sewell), in the Bay of Bengal (Sewell), off the Madras coast (Menon), in the Laccadive Sea (Sewell), in the Arabian Sea (present records), and to the north of Prince Edward Island, in lat. 47° S. In the Atlantic Ocean it has been taken in long. 2° E., in the latitude of Tristan da Cunha, and in lat. 19° S. and long. 20° W. to the east of Trinidad, and at numerous stations in the North Atlantic (Wolfenden, Sars), while further north it occurs off the Azores and in the Bay of Biscay (Farran), to the east of the Shetland Islands and in the North Seas (Farran), as far east as the Skagerrak (van Breemen), to the south-west of Iceland and in East and West Greenland waters (Jespersen). It also occurs in the Mediterranean Sea (Sars, Rose). Its occurrence in the North Sea and the Shetland region is due, according to Farran (1911), to "its being carried out of the area in which it normally lives and breeds into regions where it must ultimately perish."

Its depth distribution ranges from the surface down to about 4000 metres; but it is interesting to note that it appears to occur at considerably greater depths on the western sides of the oceans than on the eastern sides; in the Pacific Ocean Esterly found that the plurimum was at about 366 metres (200 fathoms), whereas Giesbrecht, in long. 132° W., took it in 4000 metres. In Indian waters, it was plentiful at 732 metres (400 fathoms) in the Bay of Bengal and at 366 to 1280 metres (200–700 fathoms) in the Laccadive Sea, whereas in the Arabian Sea the plurimum seems to lie at about 600 metres and it occurs well below 500 metres; off Prince Edward Island it occurred at 250 metres' depth. In the Atlantic Ocean it occurred at 3000 metres' depth in the southern area, while in the northern region its depth range is from 0–5000 metres; it was taken between 150–1000 metres' depth off Iceland, but as deep as 1000–3000 metres to the west of Greenland (Jespersen). It thus appears probable that in the North and South Atlantic Ocean it is an inhabitant in the main of the North Atlantic Intermediate Current, whereas off Prince Edward Island and in the Arabian Sea it occurs mainly in the Sub-Polar Intermediate Current.

In the present collection there is a very marked difference in the number of examples that have been taken in different regions. This is well shown in the following table:

Depth. m.	Affected area. Stas. 61 A and C, 96.	Unaffected area. Stas. 76, 172 and 186.
0–200	0	304
200–600	258	6162
600–1000	37	567
1000–1500	144	351
1500–2000	1	0

It thus seems clear that conditions in the north-west part of the Arabian Sea are much more favourable to this species than in the eastern region.

Eucalanus crassus Giesbrecht.

Eucalanus crassus, Giesbrecht, 1892, p. 132, pl. iv, fig. 9, pl. xi, figs. 8, 10, 17, 21, 22, 38, pl. xxv, figs. 4, 20, 26–28; van Breemen, 1908, p. 16, fig. 13 *a–d*; Vervoort, 1946, p. 112.

Occurrence:

Sta. 76, Gulf of Oman, 200 m., 16 specimens; 600 m., 9 females; 1500 m., 7 females, 1 male.
Sta. 96, Central part of Arabian Sea, 10 m., 2 females.
Sta. 172, Central part of Arabian Sea, 850 m., 1 female.

Distribution.—This species has an extremely wide distribution; it has been recorded from all the great oceans. In the Pacific it has been taken on the east side off San Diego (Esterly), off the coast of South America between 14° and 26° S., and on the west side of the ocean from 175° W. to 138° E. between 19° and 20° N. (Giesbrecht), and on the Great Barrier Reef of Australia (Farran). It has been taken in the Malay Archipelago (Cleve, A, Scott, Sewell). In the Indian Ocean it has been recorded from the coast of Southern Burma (Sewell), the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the central area of the Arabian Sea and the Gulf of Oman (present records), the Gulf of Aden and the Red Sea (Thompson and A. Scott, Cleve), and off the east coast of Cape Colony (Cleve). In the Atlantic it has been taken between 30° and 40° S. (Farran), off Rio de Janeiro (Giesbrecht) and Pernambuco (T. Scott), in the Mediterranean Sea (Giesbrecht), the Bay of Biscay and the Irish coast (Farran), in the North Atlantic as far north as 57° 46′ N. (With) and off the Faroe Islands (Wolfenden).

Its vertical distribution appears to range from the surface down to 1500 metres. Farran records it from the surface to below 914 metres (500 fathoms) in the Bay of Biscay.

Eucalanus monachus Giesbrecht.

Eucalanus monachus, Giesbrecht, 1892, p. 132, pl. xi, fig. 37, pl. xxxv, figs. 5, 14, 33, 36; Sars, 1925, 22; Sewell, 1929, p. 51.

Occurrence.—Sta. 172, Central part of Arabian Sea, 850–0 m., 5 females, 13 males (all immature).

Distribution.—This species has been recorded from the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean it has been taken off the coast of south Burma (Sewell), at several stations in the Bay of Bengal (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), in the Maldive Archipelago (Wolfenden), in the Arabian Sea (Cleve, present record), the Gulf of Aden and Red Sea (Cleve), east of Cape Colony (Cleve). In the Atlantic it occurs in the tropical region (Wolfenden), in the North Temperate region (Rose), off Woods Hole (Wilson), off Gibraltar (Giesbrecht), in the western Mediterranean (Giesbrecht and Schmeil, Rose), and in the Adriatic Sea (Pesta).

Eucalanus mucronatus Giesbrecht.

Eucalanus mucronatus, Giesbrecht, 1892, p. 132, pl. xi, figs. 9, 26, 34, pl. xxv, figs. 15, 35, and 38; Vervoort, 1946, p. 104.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m. depth.
Sta. 76, Gulf of Oman, 1500–0 m.

Sta. 96, Central part of Arabian Sea, 10 m. depth, 645–400 m. depth.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., vertical haul.
Sta. 145 C, Maldive area, 500–0 m., vertical.
Sta. 172, Central part of Arabian Sea, 400–0 m. and 850–0 m. depth.

Distribution.—In the Pacific Ocean between 16° and 19° N. (Giesbrecht), off New Zealand 30°–40° S. (Farran), Great Barrier Reefs of Australia (Farran), Malay Archipelago (A. Scott). In the Indian Ocean it is widely distributed, having been reported from the Nicobar and Andaman Islands (Sewell), the Ceylon Pearl Banks (Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (present records), the Gulf of Aden and Red Sea (Cleve), and east of Cape Colony (Cleve). It has also been taken in the Atlantic Ocean near the Azores (Sars).

Eucalanus pileatus Giesbrecht.

Eucalanus pileatus, Giesbrecht, 1892, p. 132, pl. xi, figs. 3, 28, 41, pl. xxxv, figs. 7, 8, 19, 39–41.

Occurrence.—Sta. 61, Northern area of Arabian Sea, surface.

Remarks.—A few examples of both this species and *E. subtenuis* Giesbr. are infected with a parasite that appears to be *Balantidium contortum* Chatton (*vide* Chatton, 1920, p. 175).

Distribution.—In the Atlantic and Pacific Oceans between 10° N. and 20° S. (Giesbrecht and Schmeil); Malay Archipelago (A. Scott). In the Indian Ocean, coast of Southern Burma (Sewell), the Nicobar Islands (Sewell), the Ceylon Pearl Banks (Sewell), the Laccadive Sea (Thompson and A. Scott), the Maldive Archipelago (Wolfenden), the coast of Southern Arabia (present record), the Red Sea (Thompson and A. Scott), the east coast of Cape Colony (Cleve). In the South Atlantic to the south of St. Helena and between St. Helena and Ascension Island (Wolfenden).

Eucalanus subcrassus Giesbrecht.

Eucalanus subcrassus, Giesbrecht, 1892, p. 132, pl. xi, figs. 6, 14, 18, 30, 39, pl. xxxv, figs. 12, 16, 31, 32; Sewell, 1929, p. 51, figs. 14–17; Vervoort, 1946, p. 108.

Occurrence:

Sta. 61 C, Northern part of Arabian Sea, surface, several females.
Sta. 96, Central part of Arabian Sea, 10 m. depth, 2 females.

Distribution.—This species has a wide distribution, occurring in all three great oceans. In the Pacific it has been recorded from the west of South America between lats. 3° S. and 10° N., and from Hongkong and Amoy (Giesbrecht), the Australian Barrier Reef, where it is plentiful (Farran), and from the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean it has been recorded from off Penang, the coast of Southern Burma, several stations in the Bay of Bengal (Sewell), the Madras coast of India (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea and Gulf of Aden (Cleve), the Persian Gulf (Pesta), the Red Sea (Giesbrecht, Cleve), and from the east of the Cape of Good Hope (Cleve). In the Atlantic Ocean it has been taken in the Tropical Atlantic off Rio de Janeiro (Farran) and in the North Atlantic (Wolfenden); it does not extend as far north as *E. crassus*, for it has not been recorded off Norway by Sars, nor from the Irish coast by either Farran or Pearson.

Eucalanus subtenuis Giesbrecht.

Eucalanus subtenuis, Giesbrecht, 1892, p. 132, pl. xi, figs. 4, 23, 42, pl. xxxv, figs. 9–11, 18, 29 and 30; Vervoort, 1946, p. 106.

Occurrence.—Sta. 61, Northern part of Arabian Sea, surface.

Distribution.—In the Pacific Ocean from the San Diego Region (Esterly), the eastern area between 15° N. and 26° S. down to 4000 metres (Giesbrecht), and the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean from the Burma coast (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott), the Maldive Archipelago (Wolfenden) and the Arabian Coast (present record). In the Atlantic Ocean between 30° N. and 26° S. (Giesbrecht and Schmeil), 14° N. to 2° S. (T. Scott, Farran), 10° S. (Wolfenden), near the Azores (Sars) and near Cape Verde Islands (Giesbrecht).

Genus *Rhincalanus* Dana.

Rhincalanus cornutus Dana, forma *typica* Schmaus.

Rhincalanus cornutus, Giesbrecht, 1892, p. 153, pl. xii, figs. 13, 15, pl. xxxv, figs. 45, 48; Sewell, 1929, p. 58.
Rhincalanus cornutus, f. *typica*, Schmaus, 1917, p. 312, figs. 5–11; Schmaus and Lehnhofer, 1927, pp. 259, 265; Vervoort, 1946, p. 116.

Occurrence:

Sta. 96, Central area of Arabian Sea, 10–0 m., 867 examples; 645–400 m., 71 examples.

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 26 specimens; 1500–0 m., 25 examples.

Sta. 145 C, Maldive area, 100–0 m., 3 examples; 300–0 m., 8 examples; 500–0 m., 2 examples.

Sta. 145 D, Maldive area, 50–0 m., 1 example; 100–0 m., 12 examples; 300–0 m., 4 examples; 500–0 m., 10 examples.

Sta. 172, Central area of Arabian Sea, 200–0 m., 57 examples; 400–0 m., 55 examples; 850–0 m., 129 examples; 2040 m., 1 example.

Sta. 186, Gulf of Aden, 250–0 m., 1 example; 570–0 m., 12 examples; 600–0 m., 10 examples.

Descriptive Notes.—All the present examples agree with the description given by Schmaus (1917) of the form that he has termed f. *typica*. A single female, adult, was obtained at Sta. 96, 10 metres depth, in which the lateral spine on each side of the 4th thoracic segment was double.

Distribution.—As Schmaus and Lehnhofer (1927, p. 382 *et seq.*) have pointed out, this form of *Rhincalanus cornutus* is in the main confined to the Pacific and Indian Oceans, and is for the most part an inhabitant of the warm equatorial region, though it has been taken in the Pacific as far north as the coast of Japan, and in the Indian Ocean as far south as lats. 64° 37′ S., long. 108° 50′ E., and lat. 63° 28½′ S., long. 90° 22′ E. (Brady).

The vertical range of this species extends from the surface down to 1000 metres depth, but it is the young stages that are taken in the upper levels, while the adults are for the most part to be found at depths below 200 metres (*vide* Schmaus and Lehnhofer, 1927, p. 392, fig. 29). The present results agree with this, and it seems probable that reproduction was in full swing near the surface at Sta. 96, in the month of December, for most of the examples taken near the surface were immature, and some were in the late nauplius stages;

it is probable that there is a second breeding period in April, for it was in these two months only that adult males were obtained, and even then they were extremely rare, two examples being taken in December and one in April.

The prevalence of the species appears to vary very considerably in different parts of the area investigated, as is indicated in the following table :

Depth. m.	Number of examples taken.	
	Stas. 96, 172.	Stas. 131 D, 186.
0–200	867	0
200–400	57	27
400–600	126	22
600–800	129	25
800–1200	1	0

The large numbers of examples occurring at or near the surface in December at Sta. 96 will be swept in a westwardly or south-westwardly direction by the north-east monsoon currents, and as these individuals sink downwards with increasing age they will enter the Sub-Polar Intermediate Current and again be carried northwards and eastwards.

Rhincalanus nasutus Giesbrecht.

Rhincalanus nasutus, Giesbrecht, 1892, p. 152, pl. iii, fig. 6, pl. ix, figs. 6, 14, pl. xii, figs. 9–12, 14, 16, 17, pl. xxxv, figs. 46, 47, 49 ; Sars, 1901, p. 15, pls. vi, vii ; Wilson, 1932, p. 34, fig. 18 ; Vervoort, 1936, p. 122.

OCCURRENCE :

Sta. 61 A, Northern are of Arabian Sea, 1000–0 m., 7 specimens ; 1500–0 m., 6 specimens.
Sta. 61 C, Northern area of Arabian Sea, 1000–0 m., 2 specimens ; 1500–0 m., 2 specimens.
Sta. 76, Gulf of Oman, 200–0 m., 44 specimens ; 600–0 m., 803 specimens ; 1500–0 m., 278 specimens.
Sta. 96, Central area of Arabian Sea, 10 m., 13 specimens ; 645–400 m., 942 specimens.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 specimen.
Sta. 145 D, Maldive region, 500–0 m., 1 specimen.
Sta. 172, Central area of Arabian Sea, 200–0 m., 667 specimens ; 400–0 m., 744 specimens ; 850–0 m., 1249 specimens ; 2090–0 m., 11 specimens.
Sta. 186, Gulf of Aden, 250–0 m., 167 specimens ; 575–0 m., 361 specimens ; 600–0 m., 1137 specimens.

REMARKS.—Schmaus and Lehnhofer (1927) have called attention to the vertical distribution of this species in the Indian Ocean, and have pointed out that the temperature range extends from 3° C. to 20° C., the maximum density of distribution occurring at a depth of about 1000 metres ; this agrees very well with the present observations. In the following table I have given the numbers taken at different depths in two regions of the Arabian Sea, namely, the Gulf of Oman Region (Stas. 61 and 76) and in the central and southern area (Stas. 96, 172 and 186) ; in the former there is marked reduction in the numbers obtained.

Depth. m.	Affected area. Stas. 61 A and C, and 76.	Unaffected area. Stas. 96, 172 and 186.
0–250	44	858
250–600	803	2884
600–1000	9	1249
1000–1500	8	..
1500–2000	0	11

It is thus clear that the maximum concentration is found at about 600–1000 metres depth, and that the range extends from close to the surface down to 1500 metres. This appears to be considerably deeper than the distribution in both the Atlantic and eastern Pacific regions; in the former area Farran (1926, p. 232) and Lysholm and Nordgaard (1921, p. 9) give the depth distribution as from the surface to 400 fathoms (0–732 metres) with a plurimum at 200–300 fathoms (366–549 metres), and from 400–1000 metres respectively, whereas in the eastern Pacific Esterly (1912, p. 317) states that "the plurimum during the day is between 100 and 200 fathoms (183 to 366 metres), though the abundance at 200–250 (366–457 metres) is a little greater." Our results clearly show that conditions at Sta. 61 in the North-Eastern Region are very different from those at the other stations, for here only 17 examples in all were taken at depths of between 500–2000 metres, whereas at the other stations we obtained at these depths no less than 4947 specimens (*vide* appendix).

Distribution.—In the Pacific Ocean between the Straits of Magellan and the Gulf of California (Farran), the San Diego region (Esterly), Southern Pacific Ocean (Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott). In the Indian Ocean, the Bay of Bengal (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Laccadive Sea (Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (Thompson and A. Scott, Cleve, present records), Gulf of Aden and Red Sea (Cleve), and the east coast of S. Africa (Cleve). In the Atlantic Ocean between Cape Colony and 65° N. (Farran), in the South Atlantic, 30°–40° S. (Farran), the North Atlantic (Farran, Sars, Cleve), the western Mediterranean (Giesbrecht), the Bay of Biscay (Farran), the North Sea (Sars), west coast of Ireland (Farran), Iceland (Sars), the east coast of America, the Gulf of Maine (Bigelow), Woods Hole region and Chesapeake Bay (Wilson), and East Greenland (Jespersen).

Farran (1911) remarks: "As far as concerns its distribution in the N.E. Atlantic it may be regarded as an inhabitant of the Atlantic Current, its distribution to the north and east depending on the varying strength of that stream."

Schmaus and Lehnhofer (1927) have clearly shown that it is largely an inhabitant of the N. Atlantic Intermediate Current in the Atlantic Ocean and of the Indian Tropical Intermediate Current in the Indian Ocean. In their charts of the vertical distribution of the species of this genus (Schmaus and Lehnhofer, 1927, p. 392, figs. 28 and 29) they have shown a break in the occurrence of this species between lats. 9° N. and S. in the Atlantic Ocean, and lats. 5° N. and S. in the Indian Ocean; but the correctness of this view is extremely doubtful; they have themselves shown that 21 examples of *R. nasutus* (♀♀) were taken in the Altantic in lat. 1° 51′ N. and 54 (♀♀) and 11 (juv.) were captured in the Indian Ocean in lat. 0° 16′ N.

Family Paracalanidæ.

Genus *Paracalanus* Boeck.

Paracalanus aculeatus Giesbrecht.

Paracalanus aculeatus, Giesbrecht, 1892, p. 164, pl. ix, figs. 20, 26, 30; Sewell, 1929, p. 62, figs. 20, 21; Vervoort, 1946, p. 127.

Occurrence:

Sta. 61 C, Northern area of the Arabian Sea, surface, 10,680 examples.

Sta. 96, Central area of Arabian Sea, 14–0 m., 2 females, 1 male, 1 juv.

Remarks.—A number of specimens are infected with a parasite that appears to be *Blastodinium contortum* Chatton (*vide* Chatton, 1920, p. 175).

Distribution.—Widely distributed throughout the tropical and temperate regions of all three oceans. In the Pacific it has been recorded from several stations in the eastern area and from the western side between 10° N. and 10° S., from Hongkong (Giesbrecht), the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl) and the Malay Archipelago (A. Scott). In the Indian Ocean it has been taken off the coast of S. Burma, the Andaman and Nicobar Islands and the Ceylon Pearl Banks (Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (A. Scott, present record), the Gulf of Aden and Red Sea (Giesbrecht, A. Scott), and the east coast of Africa (Cleve). It has also been taken in the Atlantic Ocean in the Gulf of Guinea (T. Scott as *P. parvus*), the South Atlantic between 30° and 40° S. (Farran), in the tropical part of the Atlantic Ocean (Giesbrecht, Farran) and off Cape Verde Islands (Sars).

Paracalanus denudatus Sewell.

Paracalanus denudatus, Sewell, 1929, p. 66, fig. 23; Farran, 1936, p. 80, fig. 1, *b*.

Occurrence:

Sta. 61, North part of Arabian Sea, surface; A (day), 240 specimens, C (night), 8280 specimens.

Sta. 96, Central area of Arabian Sea, 14–0 m., 3 females.

Remarks.—This species was described by me from specimens taken in the Andaman and Nicobar Islands. It has since been recorded by Farran from the Barrier Reefs of Australia, where it was " probably the most abundant species in the collections made at 3 miles E. (of Low Isles), occurring in large numbers in all the fine-meshed nets from which samples of the smaller species were available." The present record extends its range westward to the northern area of the Arabian Sea, and it is probably widely distributed throughout the western Pacific and Indian Oceans.

Paracalanus parvus Giesbrecht.

Paracalanus parvus, Giesbrecht, 1892, p. 164, pl. i, fig. 5, pl. vi, figs. 28–30, pl. ix, figs. 5, 11, 25, 27, 31 and 32; Sewell, 1929, p. 68, figs. 24 and 25; Vervoort, 1946, p. 130.

Occurrence: Sta. 61, North part of Arabian Sea, surface, C (night), 2760 specimens.

Remarks.—Wolfenden (1906*b*, p. 997) has called attention to the fact that in this species slight differences can be detected in specimens from the Indian and Mediterranean regions on the one hand and the North Atlantic on the other; he has termed these two forms var. *borealis* and var. *indicus* respectively. As one would expect, the northern boreal form is larger than the tropical or sub-tropical form, the respective sizes being 1·0–1·1 mm. in *borealis* and 0·8–1·0 mm. in *indicus*. In a species with such a wide distribution some variation in structure is only to be expected, and it is possible that there are two geographical races, similar to the races that are known to have evolved in the species *Rhincalanus cornutus*, namely, an Indo-Pacific form that has spread into the Mediterranean through the Suez Canal, and an Atlantic form.

A number of examples are infected with a parasite that appears, usually, to be identical with *Blastodinium contortum* Chatton (*vide* Chatton, 1920, p. 175), but in a few instances the parasite resembled *Blastodinium contortum hyalinum* Chatton (*loc. cit.*, p. 193, fig. 200).

Distribution.—In the Pacific Ocean from the tropical region of the eastern area (Giesbrecht) and from 61° N. to 52° S. (Sars), the San Diego Region and San Francisco Bay (Esterly), Hong-Kong (Giesbrecht), off New Zealand (Brady, Farran), the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl) and the Malay Archipelago (A. Scott). In the Indian Ocean from the coast of S. Burma (Sewell), the Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Red Sea (Thompson and A. Scott), the Suez Canal (Gurney), Durban Bay, E. Africa (Brady). In the Antarctic Ocean from the Auckland Islands and as far South as 64° 30′ S. (Brady). In the Atlantic Ocean from the tropics and north and south temperate regions as far as 30°–40° S. (Farran), the North Temperate region (Rose), the Mediterranean Sea (Giesbrecht, Thompson and A. Scott, Rose), the Adriatic (Steuer, Früchtl) and the Black Sea (Farran), the Bay of Biscay (Farran), the coast of Devon and Cornwall (Norman and T. Scott), the Irish coast (Farran), the North Sea (Claus, Bourne, Pesta), the west part of the Baltic, Christiania Fjord and the south coast of Norway (Sars), the east coast of North America, Chesapeake Bay (Wilson), Woods Hole (Wilson), and Gulf of Maine (Bigelow), the Faroe Channel, Iceland and E. Greenland (With).

It is able to survive in a comparatively wide range of salinity, having been taken in waters of a salinity of 19·33 $^{\circ}/_{\circ\circ}$ and 35·26 $^{\circ}/_{\circ\circ}$ (Farran).

Genus *Acrocalanus* Giesbrecht.

This genus is represented by five species, namely :

Acrocalanus gracilis Giesbrecht.
A. *gibber* Giesbrecht (= *A. pediger* Cleve ♀).
A. *longicornis* Giesbrecht (? = *A. gardineri* Wolfenden ♂).
A. *monachus* Giesbrecht.
A. *inermis* Sewell.

All of these have now been taken in the region of the Malay Archipelago and the Indian Ocean. *Acrocalanus inermis* appears to be in the main an inhabitant of brackish water, but the rest are pelagic. As one traces the distribution of the genus westwards the number of species that have been recorded gradually falls off ; Gurney (1927*a*, p. 147) states that five species have been recorded from the Red Sea, but I have been able to trace references to only three, namely, *Acrocalanus gibber, gracilis* and *longicornis* ; and of these only *A. gibber* appears to have reached the Gulf of Suez and has entered the Suez Canal, where it has spread as far as Ras-el-Ech. Only one species has so far been recorded from the Atlantic Ocean, namely, *A. longicornis*, which is reported by Farran in the collections of the "Terra Nova" from the tropical region, but was absent off Rio de Janeiro, and by T. Scott in those of the "Scotia" between 20° N. and 32° S.

Acrocalanus gracilis Giesbrecht.

Acrocalanus gracilis, Giesbrecht, 1892, p. 171, pl. vi, fig. 27, pl. x, fig. 35; Sewell, 1929, p. 79, fig. 31; Vervoort, 1946, p. 134.

OCCURRENCE :

Sta. 61, North part of Arabian Sea, surface.

Sta. 136, Maldive area, surface, 23 females (adult), 6 female juv. and 1 male juv.

REMARKS.—A few specimens from Sta. 61 were infected with a parasite that appears to be *Balantidium contortum* Chatton (*vide* Chatton, 1920, p. 175).

DISTRIBUTION.—The Pacific Ocean between 20° N. and 20° S. (Giesbrecht), the Great Barrier Reefs of Australia (Farran), the Aru Archipelago (Früchtl), and the Malay Archipelago (A. Scott). In the Indian Ocean the coast of S. Burma and the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden, present record), the Arabian Sea (Thompson and A. Scott, present record), the Red Sea and Gulf of Suez (Thompson and A. Scott), and the east coast of S. Africa (Cleve, Wolfenden).

Acrocalanus longicornis Giesbrecht.

Acrocalanus longicornis, Giesbrecht, 1892, p. 171, pl. vi, figs. 25, 33, pl. x, figs. 34, 36 and 39; Sewell, 1929, p. 82, fig. 33; Wolfenden, 1906, p. 1000, pl. xcvii, figs. 1, 6, 11–13, 22–24; Vervoort, 1946, p. 133.

OCCURRENCE :

Sta. 61, North part of Arabian Sea, surface; A (day), 360 specimens; C (night), 360 specimens.

Sta. 96, Central part of Arabian Sea, 10 m. depth, 2 females.

DISTRIBUTION.—The east and west Pacific Ocean between lats. 15° N. and 10° S. (Giebrecht), the Great Barrier Reefs of Australia (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean, the coast of S. Burma and the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (Giesbrecht, present records), the Persian Gulf (Pesta), the Red Sea (Thompson and A. Scott), and the east coast of Africa (Brady). In the Atlantic Ocean in both tropical and temperate regions (Farran), and between 20° N. and 32° S. (T. Scott).

Acrocalanus monachus Giesbrecht.

Acrocalanus monachus, Giesbrecht, 1892, p. 171, pl. vi, fig. 26, pl. x, fig. 38; Wolfenden, 1906, p. 1002, pl. xcvii, figs. 4, 9, 27 and 28.

OCCURRENCE.—Sta. 61, North part of Arabian Sea, surface.

DISTRIBUTION.—In the Pacific Ocean between 5° and 9° N. (Giesbrecht), the Great Barrier Reefs of Australia (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean on the coast of S. Burma (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (present record), and the east coast of S. Africa (Cleve).

Family PSEUDOCALANIDÆ.

Genus *Calocalanus* Giesbrecht.

Calocalanus pavo (Dana).

Calocalanus pavo, Giesbrecht, 1892, p. 175, pl. i, fig. 13, pl. iv, fig. 15, pl. ix, figs. 3, 4, 13, 19, pl. xxxv, figs. 43–45; Vervoort, 1946, p. 138.

OCCURRENCE:

Sta. 61, North area of Arabian Sea, surface, many examples.
Sta. 96, Central part of Arabian Sea, 10 m., 2 females.

DISTRIBUTION.—Throughout all three great oceans. In the Pacific Ocean at several Stations in the eastern region and on the west side between 3° S. and 19° N. (Giesbrecht), off New Zealand and the Great Barrier Reefs of Australia (Farran), in the Aru Archipelago (Früchtl) and in the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean on the coast of S. Burma and the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (A. Scott, present records), the Red Sea (Giesbrecht, A. Scott). In the Atlantic Ocean in the southern area (Wolfenden), between 30° S. and 26° N. (T. Scott), the tropical and temperate regions to 40° S. (Farran), the Gulf of Guinea (T. Scott), Cape Verde Islands (Dana), Canary Islands (Thompson), the North Atlantic (Thompson and A. Scott), in the Mediterranean Sea (Giesbrecht, Thompson and A. Scott), the Adriatic (Steuer, Pesta, Früchtl), Malta (Thompson) and the Woods Hole region of N. America (Wheeler, Sharpe, Wilson).

Calocalanus plumulosus (Claus).

Calocalanus plumulosus, Giesbrecht, 1892, p. 176, pl. iii, fig. 5, pl. ix, figs. 2, 22, pl. xxxvi, figs. 39–42; Wilson, 1932, p. 41, fig. 23.

OCCURRENCE.—Sta. 61, North part of Arabian Sea, surface, several examples.

REMARKS.—♀. Total length ranges from 1·039 mm. to 1·083 mm., with an average length of 1·058.

DISTRIBUTION.—In the Pacific Ocean between lats. 0° and 11° N. (Giesbrecht), off New Zealand and the Great Barrier Reefs of Australia (Farran), in the Aru Archipelago (Früchtl) and the Malay Archipelago (A. Scott). In the Indian Ocean from the coast of S. Burma and the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive Archipelago (Wolfenden), the Arabian Sea (A. Scott, Thompson and A. Scott, present record), the Red Sea (A. Scott). In the Atlantic Ocean (Wolfenden), the Gulf of Guinea (T. Scott), the Mediterranean Sea (Giesbrecht, Thompson and A. Scott), the Adriatic (Pesta), the eastern Mediterranean (Pesta), the Gulf Stream (Wheeler), and the Woods Hole region of the North American coast (Wilson).

Genus *Clausocalanus* Giesbrecht.

Clausocalanus arcuicornis (Dana).

Clausocalanus arcuicornis, Giesbrecht, 1892, p. 186, pl. i, fig. 14, pl. ii, fig. 7, pl. x, figs. 3–8, 14, 16, 17, 19, pl. xxxvi, figs. 29–31, 34; van Breemen, 1908, p. 23, fig. 20; Farran, 1926, p. 237, pl. vi, figs. 1–3; Vorvoort, 1946, p. 140.

Occurrence.—Sta. 61 C, Northern region of Arabian Sea, surface, numerous examples.

Remarks.—A few examples were infected with a parasite that appears to be *Blastodinium contortum hyalinum* Chatton (*vide* Chatton, 1912, p. 193).

Distribution.—In the Pacific Ocean from the west coast of S. America (Giesbrecht), the San Diego Region and San Francisco Bay (Esterly), in the open ocean between 20° N. and 26° S. and off Hong-Kong (Giesbrecht), the Antarctic region and New Zealand (Farran), the Great Barrier Reefs of Australia (Farran), the Aru Archipelago (Früchtl), the Malay Archipelago (A. Scott). In the Indian Ocean on the coast of S. Burma (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Cleve, Thompson and A. Scott, present record), the Red Sea (Thompson and A. Scott), Suez Bay and the south end of the Suez Canal (Gurney), the east coast of S. Africa (Cleve). In the Atlantic Ocean as far south as 46° S. (T. Scott), throughout the temperate and tropical regions (Farran), in the North Atlantic (Thompson and A. Scott, Sars, van Breemen, Rose), Gulf of Guinea (T. Scott), the Mediterranean Sea (Claus, Giesbrecht, Thompson and A. Scott, Rose), the Adriatic (Steuer, Früchtl), the eastern Mediterranean (Pesta), the Bay of Biscay (Farran), the west coast of Ireland (Farran), the Gulf Stream (Wheeler), and South of Iceland in lat. 59° N., long 17° W. (With).

Clausocalanus farrani Sewell.

Clausocalanus farrani, Sewell, 1929, p. 94, fig. 38; Farran, 1936, p. 81.

Occurrence.—Sta. 61, North area of Arabian Sea, surface, many examples.

Distribution.—This species has now been taken off the Great Barrier Reefs of Australia (Farran), the coast of S. Burma (Sewell) and the Arabian Sea (present record). It is in all probability widely distributed throughout the western Pacific and Indian Oceans, and Farran suggests that it is sub-oceanic in habitat.

Clausocalanus furcatus (Brady).

Clausocalanus furcatus, Giesbrecht, 1892, p. 186, pl. xxxvi, figs. 32, 33 and 35; Esterly, 1911*a*, p. 223, pl. i, figs. 2, 7, 9, pl. ii, fig. 3, pl. iii, fig. 33, and pl. iv, figs. 36, 40 and 44; Vervoort, 1946, p. 144.

Occurrence.—Sta. 61 C, North region of Arabian Sea, surface, 11,280 examples.

Remarks.—A number of specimens from Sta. 61 are infected with a parasite that appears to be *Balantidium contortum* Chatton (*vide* Chatton, 1920, p. 175). In several examples the number of parasites was multiple:

2 specimens	contained	2	parasites.
1 specimen	,,	4	,,
2 specimens	,,	8	,,
3 ,,	,,	10	,,
1 specimen	,,	11	,,
1 ,,	,,	12	,,

It seems probable that these latter forms were examples of either *B. spinulosum* Chatton or *B. pruroti* Chatton.

Distribution.—In the Pacific Ocean west of S. America (Brady), the east and west regions between 20° N. and 26° S. (Giesbrecht), off New Zealand (Brady), the Australian

Barrier Reefs (Farran), off Cape Howe (Brady), the Aru Archipelago (Früchtl) and the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean off the coast of S. Burma (Sewell), the Andaman and Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, A. Scott, present record), the Red Sea (Thompson and A. Scott, A. Scott, Giesbrecht), Durban Bay (Brady), the east coast of S. Africa (Cleve). In the Antarctic from south of Tasmania, off Macquarie Island, and as far south as 64° 30′ S. (Brady). In the Atlantic Ocean between 22° N. and 26° S. (T. Scott), the temperate and tropical regions (Farran, Rose), the Gulf of Guinea (T. Scott), south-west of Sierra Leone (Brady), the Canary Islands (Thompson), Bermuda (Esterly), the North Atlantic (Thompson and A. Scott, Rose), the western Mediterranean (Giesbrecht, Rose), the eastern Mediterranean (Pesta).

Family ÆTIDEIDÆ.

Genus *Gœtanus* Giesbrecht.

Gœtanus, Giesbrecht, 1892, p. 219.

At the present time this genus includes the following species :

Gœtanus antarcticus Wolfenden.
G. armiger Giesbrecht (= *atlanticus* Wolfenden).
G. brachyurus Sars.
G. brevicaudatus Wolfenden.
G. brevicornis Esterly (= *rectus* Wolfenden, *ascendens* Esterly).
G. caudani Canu.
G. curvicornis Sars.
G. divergens Wolfenden.
G. ferox With, ♂ only.
G. hamatus A. Scott.
G. inermis Sars.
G. kruppi Giesbrecht (= *clarus* Esterly).
G. latifrons Sars (= *holti* Farran, *longispinus* Wolfenden).
G. major Wolfenden.
G. miles Giesbrecht.
G. minor Farran (= *minimus* Wolfenden).
G. pileatus Farran (= *caudani* Auct., ? *unicornis* Esterly).
G. recticornis Wolfenden.
G. robustus Sars.
G. secundus. Esterly.

In addition to the above, Brady (1918) has recorded what he considered to be a new species from the Antarctic under the name *Gœtanus antarcticus*, ignoring the fact that this name was already preoccupied by Wolfenden's species from the same region, described in 1905. Brady's description is totally inadequate, but the very short abdomen of his species presents a resemblance to *G. brachyurus* Sars.

A number of species are shown in the above list as synonyms. The form originally described by Canu under the name *caudani* is immature, and according to Sars (1925, p.

56) and With (1915, p. 104) the form recorded by subsequent authors under this name is identical with *G. pileatus* Farran. A. Scott (1909, p. 46) believes that *G. unicornis* Esterly is also a synonym of this species, but With (1915, p. 107) does not agree with this. *Gœtanus clarus* Esterly is, accordingly to A. Scott and With, the male of *G. kruppi* Giesbrecht. According to Sars (1925, p. 61) and A. Scott (1909, p. 48) *G. major* Wolfenden is a synonym of *G. kruppi* Giesbrecht, but according to Wolfenden there is in his form no lamella on the 1st basal segment of the maxilliped, so that this is doubtful. *Gœtanus atlanticus* Wolfenden is a synonym of *G. armiger* Giesbrecht; and *G. minimus* Wolfenden is probably a synonym of *G. minor* Farran.

It also seems probable that *Gœtanus divergens* Wolfenden and *G. hamatus* A. Scott may be synonyms; according to Wolfenden (1911, p. 226) in *divergens* the lamella on the 1st basal segment of the maxilliped is without the usual process, and A. Scott (1909, p. 50) in his account of *hamatus* states that the lamella was like that of *latifrons* (in which species the lamella is also without a process), but that "the preparation was slightly damaged during dissection, and the apex of the lamella was destroyed."

As regards the remaining species, *Gœtanus ferox* With, known only from the male, is doubtfully referred to this genus, the 5th pair of legs more nearly resembling those of a *Gaidius*. *Gœtanus robustus* Sars differs from other members of the genus in the absence of a spine on the forehead, and appears to be closely related to, if not identical with, the form described by Wolfenden under the name *Mesogaidius maximus*. *Gœtanus inermis* Sars, as Wolfenden (1908, p. 32) has pointed out, is in all probability not a *Gœtanus* at all; Giesbrecht's definition of the genus gives as one of the characters the presence of spines on the head and on the sides of the 5th thoracic segment, and the complete absence of these in *G. inermis* Sars thus necessitates either a modification of the definition of the genus or the removal of this species to another genus, and possibly the creation of a new one, to accommodate it.

These various species can be grouped according to the character of the exopod of the 1st leg, and the shape and size of the lamella on the 1st segment of the maxilliped:

Group I. The exopod of the 1st leg is composed of two segments only.

A. The 1st antenna is very long, twice the length of the body or more.

Gœtanus miles Giesbrecht.
G. recticornis Wolfenden.
? *G. secundus* Esterly.

B. The 1st antenna is longer than the body by 1½ times or by the last 7 segments.

Gœtanus pileatus Farran.

C. The 1st antenna is shorter than the body and reaches only to the 2nd abdominal segment.

Gœtanus minor Farran.

Group II. The exopod of the 1st leg is incompletely divided into three segments, the division between segments 1 and 2 not being complete; segment 1 is without a marginal spine.

A. The 1st basal segment of the maxilliped is without a lamella.

Gætanus armiger Giesbrecht.
G. major Wolfenden.

B. The lamella on segment 1 of the maxilliped is crest-like and is not produced distally in a lobe.

Gætanus divergens Wolfenden.

C. The lamella on basal 1 of the maxilliped is produced in a rounded or pointed lobe, which does not reach as far as the distal end of the segment.

Gætanus kruppi Giesbrecht.
G. hamatus A. Scott.
? *G. secundus* Esterly.

D. The lamella on the 1st basal segment of the maxilliped is produced in a narrow ribbon-like process that reaches as far as or even beyond the distal end of the segment.

Gætanus brevicornis Esterly.

Group III. The exopod of the 1st leg is composed of three segments, all of which bear marginal spines.

A. The lamella on the 1st basal segment of the maxilliped is crest-like and is not produced in a lobe.

Gætanus antarcticus Wolfenden.
G. latifrons Sars.
G. curvicornis Sars.

B. The lamella on the 1st basal segment of the maxilliped is produced in a rounded lobe.

Gætanus brevicaudatus Wolfenden.
? *G. secundus* Esterly.

It will be noticed that *Gaetanus secundus* Esterly appears in all three groups; the reason for this is that Esterly in his account of this species gives no description of the 1st leg, and merely states that "the swimming feet do not show any marked peculiarities." *Gætanus brachyurus* and *G. robustus* both fall in Group III, for Sars states that in both these species the 1st leg is perfectly formed; he, however, makes no mention of the character of the lamella on the maxilliped.

GROUP I.

Gætanus miles Giesbrecht.

Gætanus miles, Giesbrecht, 1892, p. 219, pl. xiv, figs. 21, 24, 25, 27, 30, pl. xxxvi, fig. 3; Thompson, 1903, p. 17, pl. i, figs. 3–5; van Breemen, 1908, p. 39, fig. 42.

OCCURRENCE :

Sta. 96, Central part of Arabian Sea, 645–400 m., 6 females, adult ; 1 male, juv.
Sta. 145 C, Maldive area, 300–0 m. vertical, 2 females.
Sta. 172, Central part of Arabian Sea, 850–0 m., 2 females.

DISTRIBUTION.—In the Pacific Ocean between 3° S. and 16° N., and 99°–115° W. (Giesbrecht), off the Great Barrier Reefs of Australia (Farran) and in the Malay Archipelago (A. Scott). In the Indian Ocean in the Bay of Bengal and Laccadive Sea (Sewell) and in the central region of the Arabian Sea (present records). In the Atlantic Ocean in 36° S. (Wolfenden), in the North Atlantic (Thompson, Farran, Sars, Rose), in the Gulf of Maine (Bigelow), off Georges Bank on the American Coast (Wilson), to the south of Iceland (With) and in Baffin Bay (Jespersen).

The vertical range appears to extend between the surface and some 4000 metres depth. Farran gives its range in the Bay of Biscay as 274–366 metres, but Thompson in the " Oceana " Collection to the west of the British Isles records it from depths as great as 3054 metres, and Sars has recorded it from the surface.

Gætanus minor Farran.

Gætanus minor, Farran, 1905, p. 34, pl. v, figs. 1–11 ; A. Scott, 1909, p. 47, pl. ix, figs. 1–8 ; Sars, 1925, p. 60, pl. xviii, figs. 3, 4.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female, adult.

DISTRIBUTION.—In the Pacific Ocean in Suruga Bay, Japan (Tanaka), off New Zealand and the Great Barrier Reefs of Australia (Farran) and in the Malay Archipelago (A. Scott). In the Indian Ocean in the Laccadive Sea (Sewell) and in the Arabian Sea (present record). In the South Atlantic Ocean (Wolfenden), off the Azores (Sars) and off the Irish coast (Farran).

The vertical range appears to extend from the surface down to 2745 metres depth ; Farran states that in the Bay of Biscay its normal range is from 275 to 450 metres, but at night it may ascend to within 90 metres of the surface, and he captured it on the surface in two hauls off New Zealand.

Gætanus pileatus Farran.

Gætanus pileatus, Farran, 1903, p. 120 (16), pl. xvii, figs. 1–11 ; Wolfenden, 1911, p. 229, pl. xxvii, figs. 1, 2, text-fig. 17 ; With, 1915, p. 104, fig. 26 ; Sars, 1925, p. 56, pl. xvii, figs. 3–6 ; Sewell, 1929, p. 103, fig. 40.

Gætanus caudani, Wolfenden, 1904, p. 114, pl. ix, figs. 20–22 ; A. Scott, 1909, p. 46, pl. viii, figs. 9–15, pl. ix, fig. 3.

? *Gætanus unicornis*, Esterly, 1906, p. 57, pl. xii, fig. 54, pl. xiii, fig. 76.

OCCURRENCE :

Sta. 96, Central part of Arabian Sea, 645–400 m., 3 females, adult, 1 juv.
Sta. 131 D, Southern part of Arabian Sea, 500–0 m. vertical haul, 1 female, juv. ; 1500–0 m. vertical haul, 1 female, juv.
Sta. 172, Central part of Arabian Sea, 400–0 m., 2 females, adult, 1 juv. ; 850–0 m., 1 female, juv.

DISTRIBUTION.—In the Pacific this species has been taken off the Great Barrier Reef of Australia (Farran), in the Malay Archipelago (A. Scott) and, if Esterly's *G. unicornis* is a synonym, as A. Scott believes, it occurs also in the San Diego region. In the Indian Ocean it has been taken in the Laccadive Sea (Sewell) and in the Arabian Sea (present records). In the Atlantic Ocean it occurs in the South Atlantic (Wolfenden), the North Atlantic (Sars), the Bay of Biscay (Farran), the west coast of Ireland (Farran), in the warm area of the Atlantic between 51° and 60° N. (Wolfenden), in the Faroe-Iceland Channel, to the south of Iceland and in Denmark Strait as far as 65° N. (With).

The vertical range appears to extend from about 183 metres down to some 2000 metres. In the Bay of Biscay it occurred between 183 and 1372 metres, with an optimum at 274–549 metres (Farran), and to the south-west of the Faeroes it is abundant at 600 metres depth (With).

Group II.

Gætanus brevicornis Esterly. (Text-fig. 9, A, B.)

Gætanus brevicornis, Esterly, 1906, p. 56, pl. ix, fig. 4, pl. xii, fig. 55.
Gætanus rectus, Wolfenden, 1911, p. 232, pl. xxvi, figs. 14–16, text-fig. 18; Sewell, 1929, p. 105.
Gætanus ascendens, Esterly, 1913, p. 182, pl. x, figs. 1, 3, 6, pl. xi, fig. 39, pl. xii, fig. 56.

Occurrence:

Sta. 131 D, Southern area of the Arabian Sea, 1500–0 m., 1 female, adult.
Sta. 172, Central part of the Arabian Sea, 850–0 m., 1 female, adult.

Descriptive Notes.—♀. Total length, 4·26 and 4·98 mm. Esterly gives the length of the single female that he obtained as 4·3 mm.; Wolfenden's two specimens, taken in the tropical area of the Atlantic Ocean, were somewhat smaller, measuring only 3·5 mm.

The proportional lengths of the cephalothorax and abdomen are as 77 to 23. The proportional lengths of the various segments of the body are as follows:

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
518	74	74	94	90	47	33	33	37 = 1000

The anterior horn is directed downwards and forwards, as in *G. armiger* Giesbrecht, and in the present specimens is somewhat stouter than in that species; Wolfenden states that in his examples of *G. rectus* it is less stout. The lateral horns on the 5th thoracic segment are rather short and stout, and are directed somewhat outwards and upwards. The genital segment is swollen ventrally, and this and the two following segments are fringed along their posterior margins with closely apposed, short, hair-like spines.

The 1st antenna reaches back to about the end of the furcal rami. The 8th and 9th segments are fused, but the 24th and 25th are separate. The proportional lengths of the segments are as follows:

Segments	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	76	50	23	23	27	29	30	49	25	27	27	50	50	51	48	50	49	58

20.	21.	22.	23.	24.	25.
54	43	59	47	40	15 = 1000

In the 2nd antenna the proportional lengths of the exopod and endopod are as 42 to 32. The proximal seta arising from the 2nd segment of the exopod springs from a raised papilla.

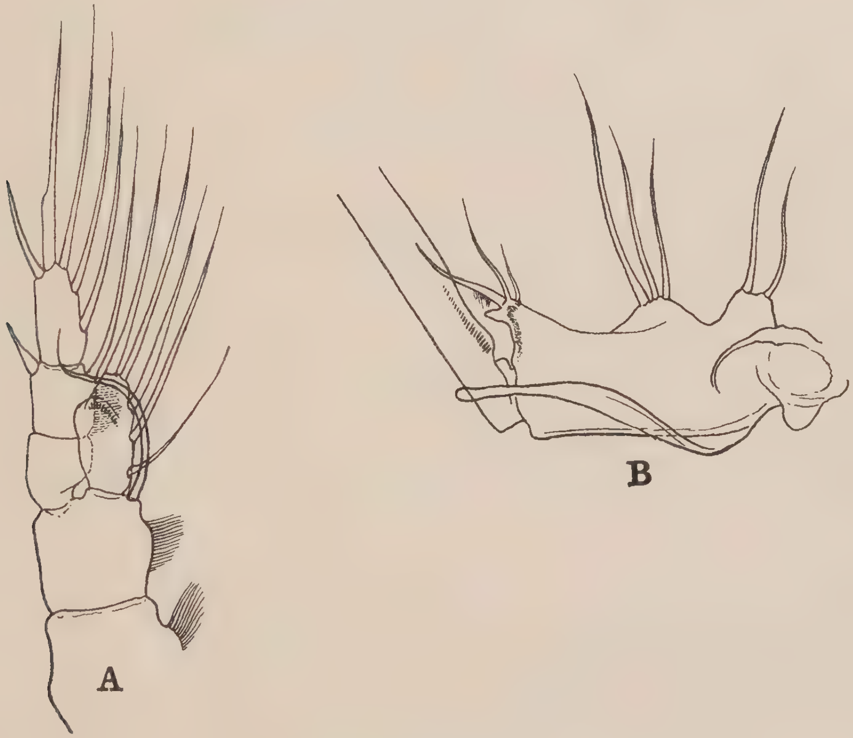
The mandible has the characteristic form of the genus; the biting ramus is very stout and is armed with strong teeth.

The 1st and 2nd maxillæ resemble those of other members of the genus.

The maxilliped differs from all other species in the genus in the great length of the free process of the lamella on the basal segment; this reaches to well beyond the distal margin of the segment, and is slightly expanded at the tip (Text-fig. 9, B).

In the 1st leg (Text-fig. 9, A) the exopod is composed of two free segments, the 1st and 2nd being only partially separated. Segment 1 is devoid of any marginal spine. The inner margins of both basal segments are fringed with a row of delicate hairs.

In the 2nd leg the endopod consists of two segments, but in the specimen dissected the division appeared to be incomplete. A gland opens to the surface at the base of the marginal spine on the 1st and 2nd segments of the exopod and near the base of the 3rd marginal spine on the 3rd segment.



Text-fig. 9.—*Gætanus brevicornis.* A, 1st leg. B, Basal portion of maxilliped.

In the 3rd and 4th legs the endopod consists of three segments. As in the 2nd leg, a gland opens on the external border near the marginal spine of the 1st and 2nd segments of the exopod, and one near the base of the 3rd marginal spine of the 3rd segment. The 1st basal segment of the 4th leg bears the usual row of modified hairs, but these are delicate and hair-like, and are about thirteen in number.

Although the descriptions given by Esterly are quite inadequate, I have little doubt that his *ascendeus* and Wolfenden's *rectus* are the same, and that the present specimens are further examples of this rare species.

Distribution.—This species has been recorded from a depth of 2000 metres in the Tropical Atlantic Ocean (Wolfenden) and from the San Diego Region of the Pacific

(Esterly.) In the Indian Ocean it occurs in the Laccadive Sea (Sewell) and the Maldive area (present record) at some depth between 1500 and 366 metres.

Gætanus kruppi Giesbrecht. (Text-fig. 10, A–F.)

Gætanus kruppi, Giesbrecht, 1903, p. 202, pl. vii, fig. 8, pl. viii, fig. 29; van Breemen, 1908, p. 41, fig. 47; A. Scott, 1909, p. 48, pl. ix, figs. 9–15, ♀, pl. x, figs. 1–9, ♂; With, 1915, p. 97, fig. 25, and pl. iii, fig. 3; Sars, 1925, p. 61, pl. xviii, figs. 5–8; Wilson, 1932, p. 52, fig. 32.
Gætanus clarus, Esterly, 1906, p. 57, pl. ix, fig. 5, pl. xiv, fig. 90.
? *Gætanus major*, Wolfenden, 1904, p. 114, pl. ix, figs. 7 and 8, and 1911, p. 231.

OCCURRENCE:

Sta. 96, Central part of Arabian Sea, 645–400 m., 4 females, adult, 1 juv.; 5 young males.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female, 1 male.
Sta. 172, Central part of Arabian Sea, 850–0 m., 63 females, adult, 3 juv.; 1 male.
Sta. 186, Gulf of Aden, 575–0 m., 4 females, 1 juv.; 1 male, juv.; 600–0 m., 42 females, 1 male adult, 3 juv.

♂. Total length, 5·17 mm.

The proportional lengths of the cephalothorax and abdomen are as 75 to 25. The proportional lengths of the various segments are as follows:

Cephalon	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd 5.	Furca.
540	71	65	75			42	74	48	42	10	32 = 1000

The body is more slender than in the female.

In the 1st antenna (Text-fig. 10, A) the segments have the following proportional lengths:

Segment	1.	2.	3.	4.	5.	6.	7.	8–10.	11.	12–13.	14.	15.	16.	17.	18.	19.	20–21.	22.	23.	24–25.
	77	41	24	26	30	33	37	81	22	50	28	50	52	54	55	63	96	63	63	55 = 1000

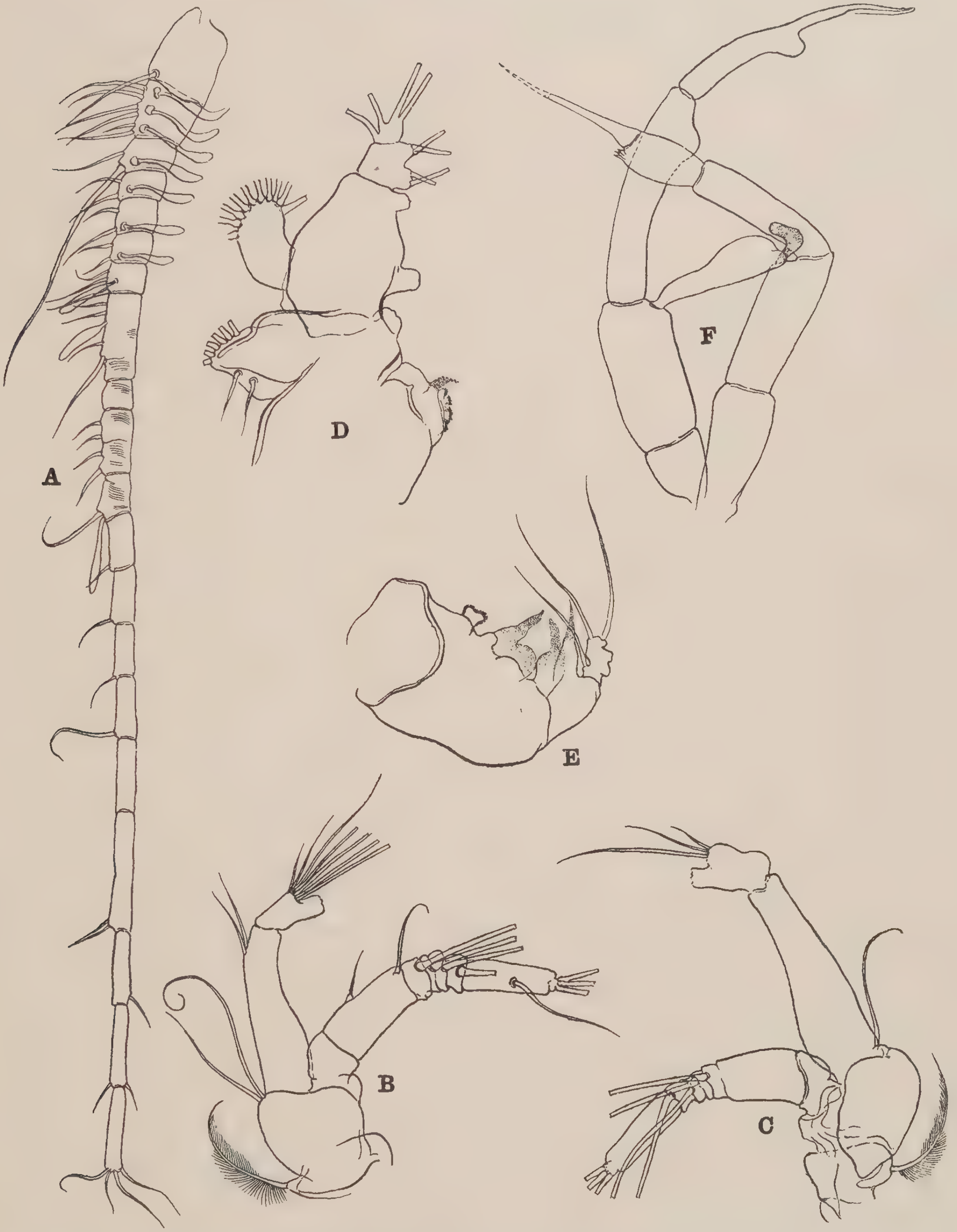
In the present specimen segments 8 and 9 are completely fused, and only a trace of the line of separation between segments 9 and 10 can be made out: segments 12 and 13 are fused, though a trace of the line of fusion can be seen: segments 20 and 21 are completely fused and so are segments 24 and 25.

The 2nd antenna (Text-fig. 10, C) differs from that of the female in that the two rami are nearly equal in length, whereas in the female the endopod is considerably the shorter. I have been unable to detect any seta on either the 2nd or the middle of the 7th segment.

The mouth parts (Text-fig. 10, D and E) are considerably reduced.

A comparison of the 5th pair of legs (Text-fig. 10, F) in the present specimen with the corresponding appendage of the form described by A. Scott (1909, pl. x, fig. 9) and of that described by With (1915, pl. iii, fig. 3 d, under the name *G. major*) reveals no marked difference, and certainly does not justify With in regarding the Malay form as being different from the Atlantic species.

Remarks.—As already mentioned, there is some doubt as to whether the form described by Wolfenden (1904) from the Faeroe Channel, and again recorded by him from the South Atlantic Ocean (1911) under the name *Gætanus major* is identical with *G. kruppi* Giesbrecht; in both his original account and again in his report on the collections of the "Gauss" Wolfenden asserts that in *G. major* there is no lamella on the basal segment of the maxilliped and, as Farran (1926, p. 249) points out, if this be confirmed, then these



Text-fig. 10.—*Gætanus kruppi*. a, 1st antenna, male. b, 2nd antenna, female. c, 2nd antenna, male. d, 1st maxilla, male. e, 2nd maxilla, male. f, 5th pair of legs, male.

two species are not identical. Wolfenden, to whom Farran submitted examples of a *Gætanus*, which were taken off Ireland, and in which a lamella was present, identified these as being examples of *G. major*, though they are identical with the form referred by With to *G. kruppi*.

Female examples of this species exhibit some variation in size. Giesbrecht's original specimens measured 3·6–4·0 mm. Wolfenden gives the length of his examples from the North Atlantic and Faroe Channel as "over 5 mm.," and of specimens in the "Gauss" collection from the tropical and southern Atlantic Ocean as from 5·0–5·6 mm.; Sars gives the length of specimens from the North Atlantic as 5·2 mm., and With's examples from the North Atlantic measured 5·4 mm. A. Scott's specimens from the Malay Archipelago measured as much as 5·7 mm. In the present collection the majority of specimens range from 4·8–5·0 mm., but a single example from Sta. 131 D measured 5·7 mm.

I was unable to detect any appreciable difference between this large form and the normal smaller specimens. The proportional lengths of the various segments of the body in the two forms were as follows:

	Cephalon and Th. seg. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
Small form	544	85	71	75	85	41	34	24	41 = 1000
Large ,,	536	85	74	79	91	40	32	23	40 = 1000

Similarly the segments of the 1st antenna showed corresponding proportional lengths:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
Small form	65	45	24	26	29	32	34	50	26	27	29	49	47	50	50	50	50	61	54	43	58	48	37	16 = 1000
Large ,,	67	49	23	24	28	30	31	51	25	27	28	52	50	51	49	50	50	59	52	43	54	48	38	15 = 1000

It seems probable that there is a correlation between the size of the individual and the depth, or, more probably, the temperature, at which it occurs:

Locality.	Depth.	Total length.
In the Mediterranean Sea	1000–2600 m.	3·6–4·0 mm.
,, Bay of Biscay	750–900 ,,	4·45–4·8 ,,
,, North Temperate Atlantic	750 ,,	4·7 ,,
,, Tropical Indian Ocean	850 ,,	4·8–5·0 ,,
,, North Temperate Atlantic	5000–0 ,,	5·0–5·6 ,,
,, Tropical Indian Ocean	1500 ,,	5·7 ,,
,, Malay Archipelago	750–1500 ,,	5·7 ,,

DISTRIBUTION.—In the Pacific Ocean in the San Diego region (Esterly) and the Malay Archipelago (A. Scott). In the Indian Ocean in the Laccadive Sea (Sewell) and the Arabian Sea (present record). In the Atlantic Ocean in the North Temperate region (Sars, Rose), off the American coast, south of Nantucket (Wilson), to the south of Davis

Strait (Jespersen), in the Bay of Biscay and the west coast of Ireland (Farran), and in the Mediterranean Sea (Giesbrecht).

The vertical range of this species appears to extend down to depths as great as 2000 metres or more but, as Farran remarks, it never approaches the surface.

GROUP III.

Gætanus antarcticus Wolfenden. (Text-fig. 11, A–F.)

Gætanus antarcticus, Wolfenden, 1905, p. 4, pl. iii, fig. 1; Wolfenden 1908, p. 30, pl. iii, fig. 6; Wolfenden, 1911, p. 229; Farran, 1929, p. 233.
[non *Gætanus antarcticus*, Brady, 1918, p. 19, pl. iii, figs. 1–6 and 19.]

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 2 females, 2 immature males.

Sta. 76, Gulf of Oman, 2500 m., 1 female.

DESCRIPTIVE NOTES.—♀. Total length, 7·6–8·25 mm.

The proportional lengths of the anterior and posterior regions of the body (Text-fig. 11, A) are as 80 to 20.

The segments of the abdomen have the following proportional lengths:

Segment 1–2.	3.	4.	5.	Furca.
37	19	17	11	16 = 100

The genital and the two following segments are each provided with a row of spines, that runs parallel to and a short distance in front of the posterior margin; this row is composed of stout triangular spines across the dorsal aspect, but on the sides and below the size of the spines is much reduced, and the row consists of minute spinules with scattered larger ones at short intervals. The genital segment is markedly produced ventrally. A tuft of hairs arises from the ventral aspect of the anal segment and from the furcal rami.

The 1st antenna is composed of twenty-four free segments; segments 8 and 9 are fused together. Wolfenden (1905, p. 7) states that there are twenty-three segments, but he figures segments 24 and 25 as being fused, whereas in the present examples they are separate. The proportional lengths of the segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
80	43	25	25	25	27	29	50	23	25	25	47	43	52	50	52	52	64

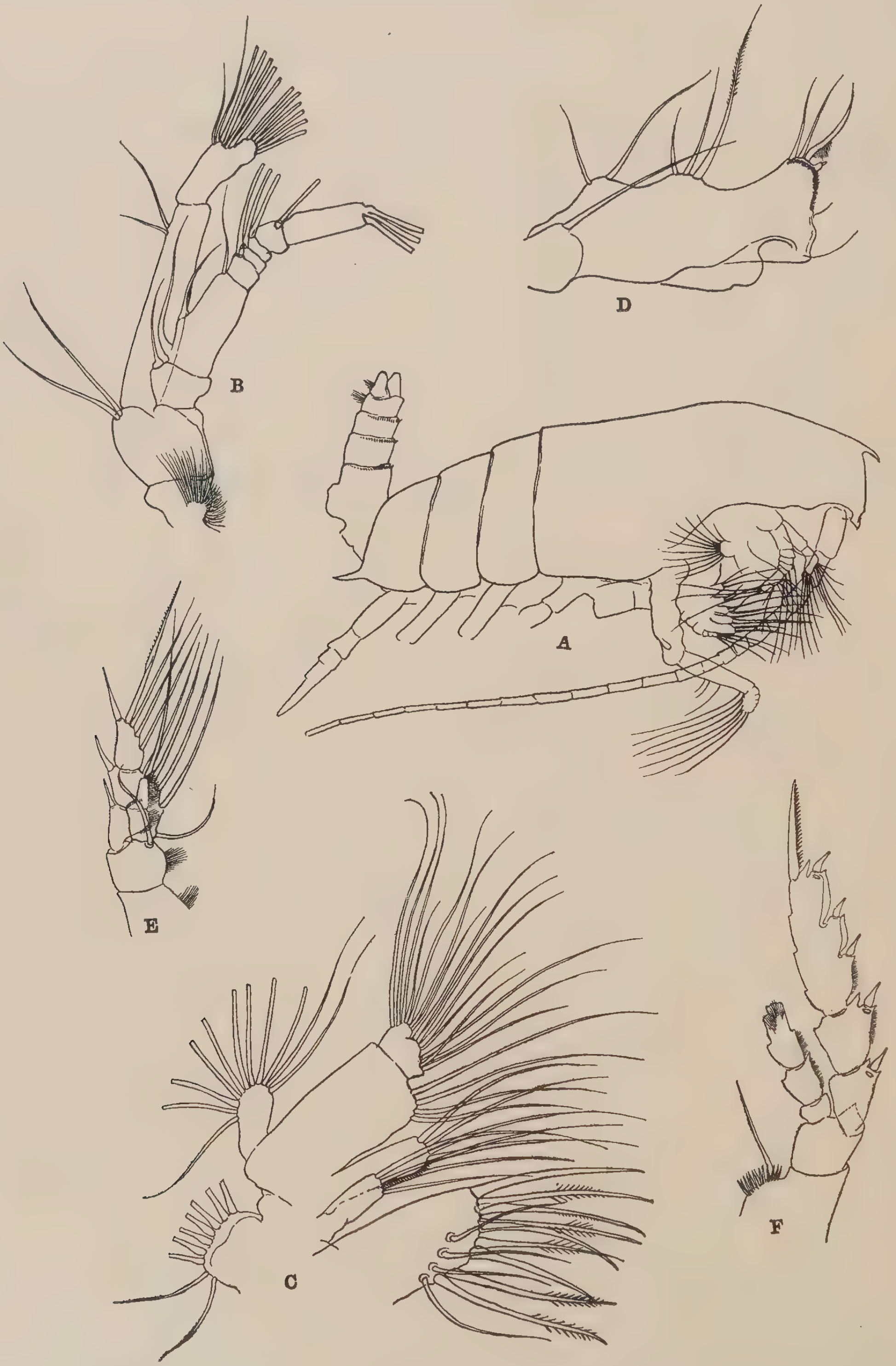
20.	21.	22.	23.	24.	25.
60	45	60	52	34	12 = 1000

The 2nd–11th segments are each furnished with a transverse row of hairs running across the posterior aspect near to and parallel with the distal margin.

In the 2nd antenna (Text-fig. 11, B) the endopod is very much "more than half as long" as the exopod; the actual measurements in the present specimen are as 63 to 70. The 1st basal segment is furnished with a tuft of fine setæ on its inner aspect.

In the maxilliped (Text-fig. 11, D) the lamella on the 1st basal segment is rounded at its distal end and is not produced in a hook-like process.

In the swimming legs (Text-fig. 11, E and F) there are tufts of fine hairs on the anterior aspect of the distal segment of the endopod. Secretory glands are present on all three segments of the exopod of the 2nd–4th legs, and these open by pores situated close to the base of the marginal spine at the distal external angle.



Text-fig. 11.—*Gætanus antarticus*. A, Female, lateral view. B, 2nd antenna. C, 1st maxilla. D, Maxilliped, basal segment. E, 1st leg. F, 4th leg.

Distribution.—Up to the present time this species has been taken only in the Antarctic region: it was originally caught at the edge of the pack-ice in lat. 64° 18′ S.; long. 80° 27′ E. from 2000 metres depth by the "Gauss," and in Macmurdo Bay in about lat. 77° S., long. 165° E. under the ice by the "Discovery." Farran records it in the "Terra Nova" collections from about lat. 71° 41′ S., long. 170° W. Its occurrence in the deep water at the northern end of the Arabian Sea and in the Gulf of Oman is therefore somewhat surprising. Presumably it has been carried northward in the Antarctic Bottom Drift or the intermediate current.

Gætanus curvicornis Sars. (Text-fig. 12, A–E.)

Gætanus curvicornis, Sars, 1925, p. 55, pl. xvii, fig. 2; Jespersen, 1934, p. 61.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 2 females.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.

Descriptive Notes.—♀. Total length, 3·75 mm.

The proportional lengths of the anterior and posterior regions of the body are as 75 to 25. In its general appearance this species closely resembles *Gætanus minor* Farran; the anterior horn in two of these specimens was curved downwards; in the third, however, it appeared to have been damaged at the base, and projected straight forwards; in all three specimens it is continued back in a low crest on the dorsal aspect. The proportional lengths of the segments of the body are as follows:

Cephalon & Th. 1.	Th. 2.	3.	4–5.	Abd. 1–2.	3.	4.	5.	Furca.
523	72	64	110	85	38	38	30	38 = 1000

The line of fusion of the cephalon and the 1st thoracic segment is clearly visible across the dorsal aspect. The spines on the 5th thoracic segment are long and slender, and reach back for about three-fourths the length of the genital segment. The genital segment of the abdomen is almost as deep as long, and is swollen ventrally. The posterior margins of the abdominal segments are devoid of any row of spines. The furcal rami are about two-thirds as wide as long, and are directed straight backwards; they are not divergent.

The 1st antenna over-reaches the posterior end of the body by about the last three segments; the proportional lengths of the segment are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	67	43	19	19	21	24	24	42	23	25	28	52	48	48	48	49	50	62	62	50	62	54	62	18 = 1000

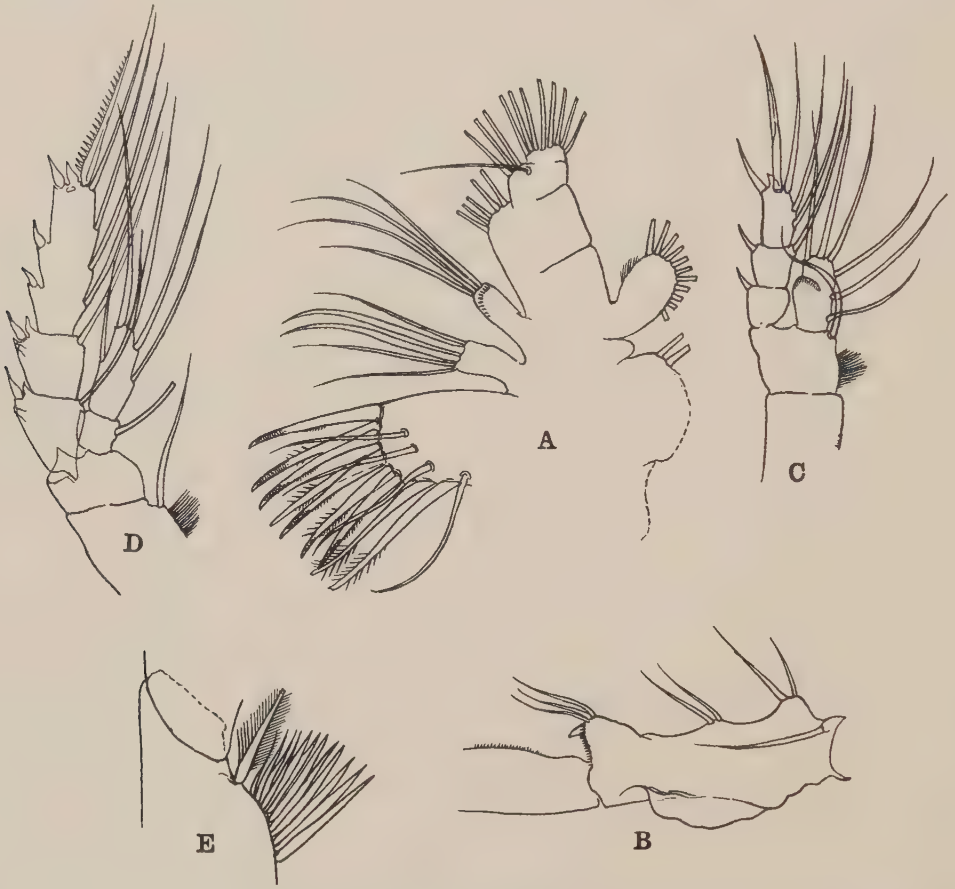
The 8th and 9th segments are fused, but the 24th and 25th are clearly separate.

In the 2nd antenna the exopod is about one-and-a-quarter times the length of the endopod. In the 2nd segment of the exopod both the first two setæ arise from small projections on the anterior aspect of the segment, as in *G. antarcticus*.

The mandible and 1st (Text-fig. 12, A) and 2nd maxillæ resemble those of other members of the genus.

The maxilliped (Text-fig. 12, B) is provided with a lamella on the 1st basal segment; this lamella resembles that of *Gætanus antarcticus* Wolfenden and *G. latifrons* Sars in being crest-like and having no hook-like process.

In the 1st leg (Text-fig. 12, C) the exopod is composed of three segments, each of which bears a marginal spine; that on the 1st segment is somewhat delicate, and is smaller than those on either the 2nd and 3rd segments, and that on the 3rd segment is about twice the length of that on the 2nd.



Text-fig. 12.—*Gætanus curvicornis* Sars, ♀. A, 1st maxilla. B, Basal segment of maxilliped. C, 1st leg. D, 2nd leg. E, Basal segment of 4th leg.

In the 2nd leg (Text-fig. 12, D) the endopod is composed of two segments. A gland opens on the surface on each of the three segments of the exopod; in the 1st and 2nd segments the aperture is on the outer border, close to and immediately proximal to the marginal spine; on the 3rd segment it opens close to the base of the 3rd marginal spine.

In the 3rd and 4th legs the endopod is composed of three segments.

The 2nd basal segment of the 4th leg (Text-fig. 12, E) bears the usual row of modified hairs; in all there appear to be about twelve that increase in size towards the proximal end of the row.

Distribution.—This species has now been reported from the North Atlantic in the neighbourhood of the Azores, and between these islands and the coast of Portugal (Sars) and from the northern part of Baffin Bay to the west of Greenland (Jespersen); the present record extends the range to the Arabian Sea.

Gætanus latifrons Sars.

Gætanus latifrons, Sars, 1905, p. 11 ; van Breemen, 1908, p. 39, fig. 43 ; A. Scott, 1909, p. 49, pl. x, figs. 10–17 ; Sars, 1925, p. 57, pl. xvii, figs. 7–9 ; Rose, 1929, p. 18, pl. i, fig. 2 ; Sewell, 1929, p. 102.
Gætanus holti, Farran, 1905, p. 33, pl. vi, figs. 1, 12.
Gætanus longispinus, Wolfenden, 1905, p. 7, pl. iii.

Occurrence.—Sta. 145 D, Maldive Area, 500–0 m., vertical, 1 juv.

Distribution.—In the Pacific Ocean this species has, up to the present, been taken only in the Malay Archipelago (A. Scott). It has been taken in the Indian Ocean in the Bay of Bengal and Laccadive Sea (Sewell), and in the Maldive area (present record). In the Atlantic Ocean it occurs in the " Gauss " collection (Wolfenden), in large numbers to the south of the Canary Islands (Sars), and in the Bay of Biscay (Rose) ; it is common off the west coast of Ireland (Farran), and has been taken as far north as 65° N. off the east coast of Greenland (With).

As regards its depth distribution, this species appears to inhabit depths ranging off Ireland from 600 to 2100 metres ; in the North Atlantic it has been taken at depths of approximately 600 to 1000 metres. In the Indian Ocean it occurs at depths of 366 to 732 metres, and the single specimen taken in the Malay Archipelago by the " Siboga " was in a haul from 750 to 0 metres.

Genus *Euchirella* Giesbrecht.

A number of species have been placed in this genus by different authors, but Sars (1920) has removed several to his new genus *Pseudochirella*, and the species that now remain in *Euchirella* are as follows :

Euchirella amœna Giesbrecht.
E. bella Giesbrecht.
E. bitumida With.
E. brevis Sars.
E. curticauda Giesbrecht.
E. galeata Giesbrecht.
E. gracilis Esterly.
E. intermedia With.
E. latirostris Farran.
E. maxima Wolfenden.
E. messinensis (Claus).
E. orientalis Sewell.
E. plumosa Brady.
E. propria Esterly.
E. pulchra (Lubbock).
E. rostrata (Claus).
E. rostromagna Wolfenden.
E. similis Wolfenden.
E. simplex Esterly.
E. truncata Esterly.

Of these some seem to me to be synonymous ; thus *Euchirella truncata* Esterly, *E. gracilis* Wolfenden and *E. intermedia* With are in all probability synonyms ; and, similarly, *E.*

galeata Giesbrecht and *E. bitumida* With probably only represent respectively the Pacific and Atlantic forms of the same species. *Euchirella tumida*, very imperfectly described and figured by Brady (1918, p. 20), is probably a synonym of *Scolecithrix danæ* (Lubb.).

It is probable that in the near future these species will have to be separated into two groups, in which the structure of the 5th pair of legs in the male is different. Up to the present time the males of some species are still unknown, but among those that have been described we can distinguish two distinct types, as follows :

" Messinensis " Type.	" Curticauda " Type.
The 2nd basal segment of the left leg reaches, at most, only as far as the distal end of basal I of the right leg.	The 2nd basal segment of the left leg reaches well beyond the distal end of basal II of the right leg.
The endopod of the left leg is extremely short or may be absent altogether.	The endopod of the left leg is a long cylindrical segment that is at least half the length of the 1st segment of the exopod.
The endopod of the right leg is long and reaches as far as the end of the exopod so as to form a pair of pincers.	The endopod of the right leg is comparatively short and only reaches as far as the end of the proximal segment of the exopod, and in consequence a pair of pincers is absent.

In the " Messinensis " Group can be placed *Euchirella messinensis*, *E. bella*, *E. truncata*, *E. orientalis*, *E. propria* and *E. pulchra*, while *E. amœna* would also seem to belong to this group, though the structure of the left leg differs slightly in this species from that of the others, since the three segments of the exopod of the left leg are inserted distally to each other, whereas in all the other species the third segment is inserted a little proximally to the end of the 2nd segment, so as to form a small pair of pincers.

In the " Curticauda " Group can be placed *Euchirella curticauda*, *E. maxima*, *E. rostrata* and *E. rostromagna* : in this group the type of 5th leg approximates to that present in males of *Chirundina* and *Pseudochirella*.

It seems probable that a second difference between these two groups is to be found in the character of the exopod of the 1st leg. In the males of *Euchirella curticauda*, *rostrata* and *maxima*, the 1st and 2nd segments of the exopod of this leg are furnished with a marginal spine that is moderately, or even well, developed ; in the males of *Euchirella bella*, *messinensis*, *orientalis*, *pulchra* and *venusta* the portion of the exopod that corresponds to segment 1 is totally devoid of any marginal spine, and on segment 2 there is either no spine at all or only a very small and rudimentary one.

In the females of the " messinensis " group the basal segment of the 4th leg is armed with a row of spines ; in those of the " curticauda " group the corresponding projections have the character of flat plates, in several species definitely triangular in shape, as in *Euchirella rostrata*, *rostromagna* and *latirostris*.

"MESSINENSIS" GROUP.

Euchirella bella Giesbrecht. (Text-fig. 13, A–F.)

Euchirella bella, Giesbrecht, p. 232, pl. xv, fig. 26; Sewell, 1929, p. 109.
Euchirella bella var. *indica*, Wolfenden, 1906, p. 1006, pl. xcvi, figs. 17–20.
Euchirella hessei (*non* Brady), A. Scott, 1909, p. 54.
Euchirella rostrata (*non* Claus), Thompson and A. Scott, 1903, p. 244.

OCCURRENCE:

Sta. 61 A, Northern part of Arabian Sea, 500–0 m., 1 female; 1000–0 m., 1 female; 1500–0 m., 8 females.
Sta. 61 C, Northern part of Arabian Sea, 1000–0 m., 14 females, 1 male, 4 juv.; 1500–0 m., 3 females.
Sta. 76, Gulf of Oman, 1500–0 m., 2 females.
Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female, 1 male.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., vertical haul, 1 female.
Sta. 145 C, Maldive area, 500–0 m. vertical haul, 1 female.
Sta. 145 D, Maldive area, 100–0 m. vertical haul, 2 females; 500–0 m. vertical haul, 1 female adult, 1 female juv., 1 male, juv.
Sta. 172, Central part of Arabian Sea 200–0 m. 1 female.
Sta. 186, Gulf of Aden, 250–0 m., 4 females.

♀. Total length, 3·68 to 3·86 mm. This agrees closely with the measurements given by Giesbrecht, 3·8 mm., and by Wolfenden, 3·5 mm. As in other species, it seems probable that there is an increase in size with depth, for of the examples taken at Sta. 61, in the Arabian Sea, those from a depth of 500 metres measures on the average 3·68 mm., while those from 1000–1500 metres were on the average 3·75 mm.

The proportional lengths of the cephalothorax and abdomen are as 78 to 22. The proportional lengths of the various segments are as follows:

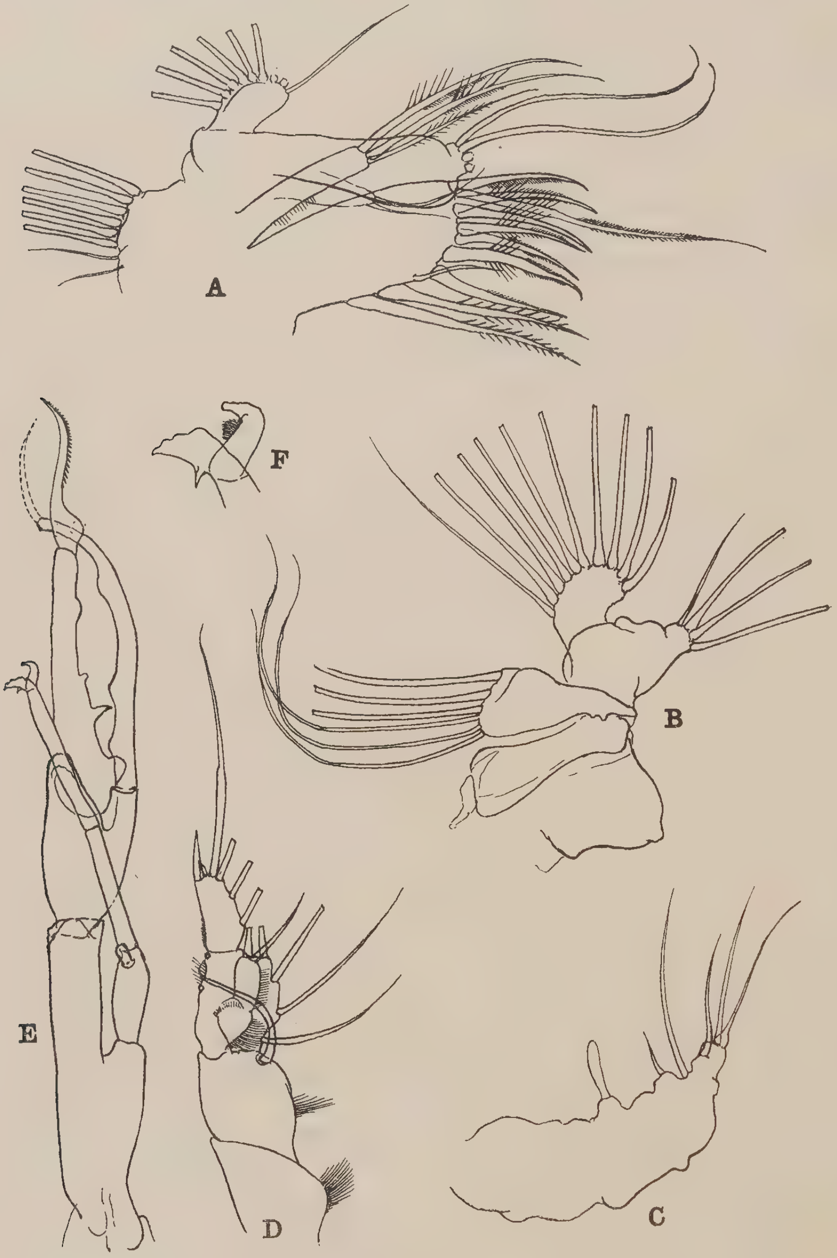
Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
389	146	88	79	88	92	36	29	13	40 = 1000

The cephalon and 1st thoracic segment are fused, but the line of fusion is clearly visible across the dorsal aspect. The rostrum is slightly depressed and is directed downwards. The posterior thoracic margin is rounded. The genital segment of the abdomen is swollen ventrally. The posterior margins of the genital and 3rd segments are fringed on the dorsal aspect with a series of weak spines, that appear to have been produced by the splitting of the chitinous margin. In the 4th segment these spines are stronger. The 5th or anal abdominal segment is very short and is telescoped into the 4th, and bears a tuft of hairs on the ventral aspect.

The 1st antenna is composed of 23 free joints, segments 8 and 9, and 24 and 25 respectively being fused; it reaches back to about the middle of the abdomen. The proportional lengths of the segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.
62	48	25	24	24	24	24	40	26	28	29	44	46	62	62	63	62	62	56	48	46	41	54 = 1000

A. Scott (1909, p. 54) has pointed out that the spines on the 2nd basal segment of the 4th leg may vary from 3 to 4, and in rare cases even 5 may be present: this variation may even occur in a single specimen, for in one example dissected there were three spines on one side and five on the other.



TEXT-FIG. 13.—*Euchirella bella* Giesbrecht. A, 1st maxilla, female. B, 1st maxilla, male. C, 2nd maxilla, male. D, 1st leg, male. E, 5th pair of legs, male. F, Terminal claw of left 5th leg, male.

Associated with the females in this collection were two examples of a mature male, which I have no doubt belong to this species.

♂. Total length 3·50 mm.

The proportional lengths of the cephalothorax and abdomen are as 73 to 27.

The proportional lengths of the various segments of the body are as follows :

Cephalon & Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
462	90	80	104	75	52	47	47	14	28 = 1000

The forehead is rounded, without a crest, and the rostrum is depressed. The posterior thoracic margin is rounded.

The abdomen is composed of five segments, of which the 5th is almost completely telescoped into the 4th. The 2nd, 3rd and 4th segments of the abdomen are provided along their posterior margins with a row of triangular spines. The anal segment bears a tuft of hairs ventrally.

The 1st antenna reaches back to about the middle of the abdomen ; certain segments are fused together, but this fusion differs on the two sides ; on the left side, segments 8 and 9 are fused together and segment 10 is, partially at least, fused with 9 ; segments 12 and 13 and 24 and 25 respectively are also fused together ; on the right side, in addition to the above, segments 20 and 21 are fused.

The proportional lengths of the segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12–13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.
Right	67	51	23	22	24	22	26	59		22	69	46	63	60	67	58	64	105		51	45	51 = 1000
Left	66	51	26	23	26	23	26	36	21	26	65	48	58	60	63	59	64	58	51	51	49	50 = 1000

In the 2nd antenna the endopod is about half the length of the exopod.

The mandible is reduced and the biting ramus is entirely absent.

The 1st maxilla (Text-fig. 13, B) is also reduced and is very similar to that of *E. messinensis*, as figured by Giesbrecht (1902, pl. xv, fig. 17). The inner lobes are entirely absent, and the 2nd basal segment and small endopod are fused, and the latter is rounded distally and bears three setæ ; the exopod is well formed and bears 10 setæ, and the outer lobe bears six.

The 2nd maxilla (Text-fig. 13, C) is reduced to a small, only partially segmented, process.

The maxilliped is moderately well developed.

In the 1st leg (Text-fig. 13, D) the exopod is composed of two segments, of which the proximal is devoid of any marginal spines : two glands appear to open on the external margin, one near the middle of the segment and the second at the distal outer angle. The distal segment of the exopod bears a stout marginal spine at the distal outer angle. The endopod consists of a single segment, and the outer margin is produced in a rounded swelling that bears a row of needle-like spinules.

The 2nd, 3rd and 4th legs resemble those of the female.

The 5th pair of legs (Text-fig. 13, E, F) closely resemble those of *Euchirella messinensis* Giesbrecht, *E. pulchra* (Lubbock), *E. propria* Esterly, *E. orientalis* Sewell and *E. intermedia* With.

Distribution.—This species appears to be confined to the Indo-Pacific region. It has been recorded from the west coast of S. America (Giesbrecht), the Malay Archipelago (A. Scott), the Bay of Bengal (Sewell), the Laccadive Sea (as *rostrata*, Thompson and A. Scott), the Maldive Archipelago (Wolfenden) and the Arabian Sea (present records).

Euchirella galeata Giesbrecht. (Text-fig. 14, A–F.)

Euchirella galeata, Giesbrecht, 1892, p. 233, pl. xv, fig. 18, pl. xxxvi, figs. 25, 26; Sewell, 1929, p. 110, fig. 41, *a–e*; Esterly, 1905, p. 115, fig. 22.

? *Euchirella bitumida*, With, 1911, p. 131, fig. 34, pl. v, fig. 9, *a–g*, pl. viii, fig. 4, *a–e*; Sars, 1925, p. 74, pl. xxi, figs. 15–18.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 22 females, adult; 21 females, juv.; 12 males, juv.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., 1 female.
Sta. 145 C, Maldive area, 50–0 m., 1 female, juv.
Sta. 145 D, Maldive area, 500–0 m., 2 females, adult.
Sta. 172, Central part of Arabian Sea, 400–0 m., 62 females, adult, 22 juv.; 850–0 m., 38 females, 5 juv.
Sta. 186, Gulf of Aden, 600–0 m., 10 females, adult, 2 juv.

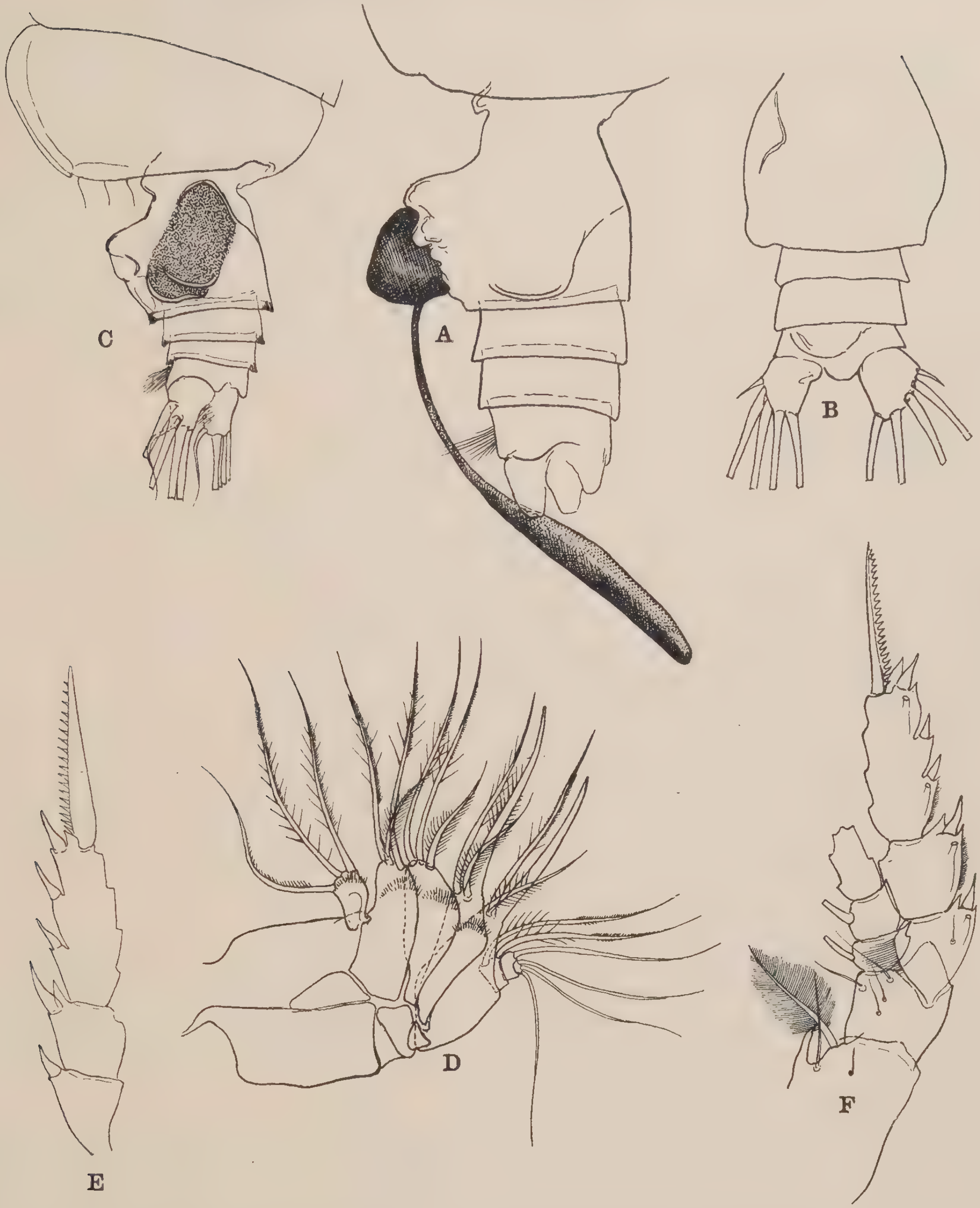
Descriptive Notes.—♀. Total length, 6·10 mm. Giesbrecht's original specimen and those taken by Esterly, from the west coast of America were somewhat larger than this, measuring 6·4 and 6·5 mm.

The proportional lengths of the anterior and posterior regions of the body are in the present specimens as 4·2 to 1; Giesbrecht gives the proportions in his example as 5 to 1·4, which is equivalent to 3·57 to 1.

The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 2.	Abd. 4.	Abd. 5.	Furca.
368	150	95	89	85	95	34	29	26	29 = 1000

The cephalon and 1st thoracic segment are fused, but in stained specimens a clear line of fusion, deeply stained, can be seen right across the lateral and dorsal aspects. The posterior thoracic margin is rounded, but just above the ventro-lateral point there is a small emargination, that presumably marks the fusion of the 4th and 5th segments. In the abdomen (Text-fig. 14, A–C) the genital segment is large, being one-and-a-half times the length of the next two segments together; when viewed from the dorsal aspect the left side is more prominent than the right (*vide* Sewell, 1929, p. 111, fig. 41, *a*), but if the animal be slightly rotated over towards the left, the right side of the segment presents a swelling, the form of which agrees closely with the figure given by With for this segment in *Euchirella bitumida* (*vide* With, 1915, pl. v, fig. 9, *a*). When viewed from the side there is a sharp ridge across the anterior region of the segment ventrally and posteriorly to this the margin rises up to a ridge that runs across the segment immediately in front of the genital aperture; from this point the margin slopes backwards and upwards to the posterior border; above the genital aperture and occupying the greater part of the left side is a swelling that stains deeply and is edged above by a chitinous thickening, while a second similar thickening marks the posterior border of the swelling.



Text-fig. 14.—*Euchirella galeata* Giesbrecht, ♀. A, Abdomen from the left side, with spermatophore attached. B, Abdomen, from above and slightly tilted to the left. C, Abdomen, from the left side. D, 2nd maxilla. E, Exopod of 2nd leg. F, 4th leg.

The 1st antenna reaches back to a little beyond the posterior margin of the genital segment. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	66	45	22	21	24	23	23	40	30	32	29	47	45	66	65	73	69	64

20.	21.	22.	23.	24–25.	
53	43	41	36	43	= 1000

As in *E. bitumida* With, the 17th segment is the longest.

In the 2nd antenna the proportional lengths of the two rami are as 18 to 59, the endopod thus being a little less than one-third the length of the exopod; the two lobes of the 2nd joint of the endopod each bear 6 setæ, the two innermost on the inner lobe being smaller and more delicate than the others.

The mandible is strong, and the biting ramus is provided with stout teeth.

The 1st maxilla bears 13 spines on the 1st inner lobe, 4 on the 2nd and 3 on the 3rd, the two outer ones being small and delicate and the middle one stout. The 2nd basal segment bears 2 small and 1 large setæ, and the endopod 4. The exopod bears 11 setæ, of which the first two are smaller than the others; With (*loc. cit.*, p. 131) states that in *E. bitumida* the 5th is also small, but that is not the case in the present specimen. The outer lobe bears 6 large and 2 small setæ.

The 2nd maxilla (Text-fig. 14, D) closely resembles that of *E. truncata* Esterly and *E. bitumida* With.

In the maxilliped the proportional lengths of the two basal segments are as 42 to 47 and the endopod is 24; the outer border of the 2nd basal segment is slightly sinuous. With remarks that in *E. bitumida* " the Ri II has only 3 setæ "; this is the condition in *E. galeata*, and in all the other species that I have so far examined, namely *bella*, *rostrata*, *pulchra*, *venusta*, *orientalis* and *truncata*.

In the 1st leg the fusion of segments 1 and 2 of the exopod is complete and I could not detect any trace of the line of fusion.

In the 2nd leg (Text-fig. 14, E) the marginal spine on segment 2 of the exopod reaches to the base of the 1st spine on segment 3.

In the 4th leg (Text-fig. 14, F) the 1st basal segment bears a single spine that is moderately stout and reaches as far as the distal end of the segment. In some specimens the spine was broken, but in no case was more than one spine present, and the two sides were symmetrical.

REMARKS.—As I have previously pointed out (Sewell, 1929, p. 110), Farran considers that *E. bitumida* With is the Atlantic representative of *E. galeata*, which he considers to be a Pacific form; I am of the opinion that, in all probability, they are the same species, and that such slight differences as may be present in the character of the genital segment, on which the distinction is based, should only be regarded as of varietal value and are not truly specific.

DISTRIBUTION.—The form *galeata* has been recorded from west coast of South America (Giesbrecht), the San Diego region (Esterly), the Malay Archipelago (A. Scott), the Bay of Bengal and the Laccadive Sea (Sewell), the Arabian Sea and the Gulf of Aden (present records), the South Atlantic Ocean (Wolfenden) and the North Atlantic (Lysholm and Nordgaard); the form *bitumida* has been recorded from the North Atlantic by Sars, With and Farran.

Euchirella orientalis Sewell. (Text-fig. 15, B–H.)

Euchirella orientalis, ♀, Sewell, 1929, p. 115, fig. 44.

OCCURRENCE:

Sta. 61 C, Northern part of Arabian Sea, surface, 2 males.

Sta. 96, Central part of Arabian Sea, 645–400 m., 40 females, adult, 4 females, juv.; 2 males, adult, 1 male, juv.

Sta. 145 C, Maldive area, 500–0 m. vertical, 1 female adult.

Sta. 172, Central part of Arabian Sea, 200–0 m., 1 female, adult; 400–0 m., 23 males, 82 females; 850–0 m., 61 females, 16 males.

Sta. 186, Gulf of Aden, 575–0 m., 23 females, adult; 2 males, adult, 3 juv.; 600–0 m., 62 females, adult, 5 males.

Descriptive Notes.—♀. The total length ranges from 4·33 to 4·40 mm. The proportional lengths of the cephalothorax and abdomen are as 80 to 20. The proportional lengths of the various segments are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
360	181	87	82	82	102	26	23	23	34 = 1000

There is no frontal crest, and the rostrum is depressed and is directed vertically downwards. The cephalon and 1st thoracic segment are only partially fused. The posterior thoracic margin is rounded. In the abdomen (Text-fig. 15, c) the genital segment is nearly symmetrical and there is no prominent swelling on the left side. The dorsal aspect is produced in a swelling, and there is a moderate swelling ventrally around the genital aperture. The posterior margins of the first two segments are fringed dorsally with a row of spinules, and a tuft of hairs arises from the ventral aspect of the anal segment.

The 1st antenna reaches back to about the middle of the abdomen. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	57	46	21	24	24	24	23	44	28	31	31	43	46	66	61	66	60	65

20.	21.	22.	23.	24–25.
56	46	47	39	52 = 1000

In my original account of this species I gave the length of the first two segments together as 343 parts in 1000; this is an obvious error, and the figure should be 96.

In the maxilliped (Text-fig. 15, d) the proportional lengths of the two basal segments are as 41 to 59. The posterior margin exhibits two low prominences in the proximal half of the segment.

In the 4th leg (Text-fig. 15, f) the 1st basal segment usually bears two spines that are subequal and reach as far as the distal end of the segment.

Associated with the females at Stas. 96 and 172 were a number of adult males, that are, I think, the true male of this species.

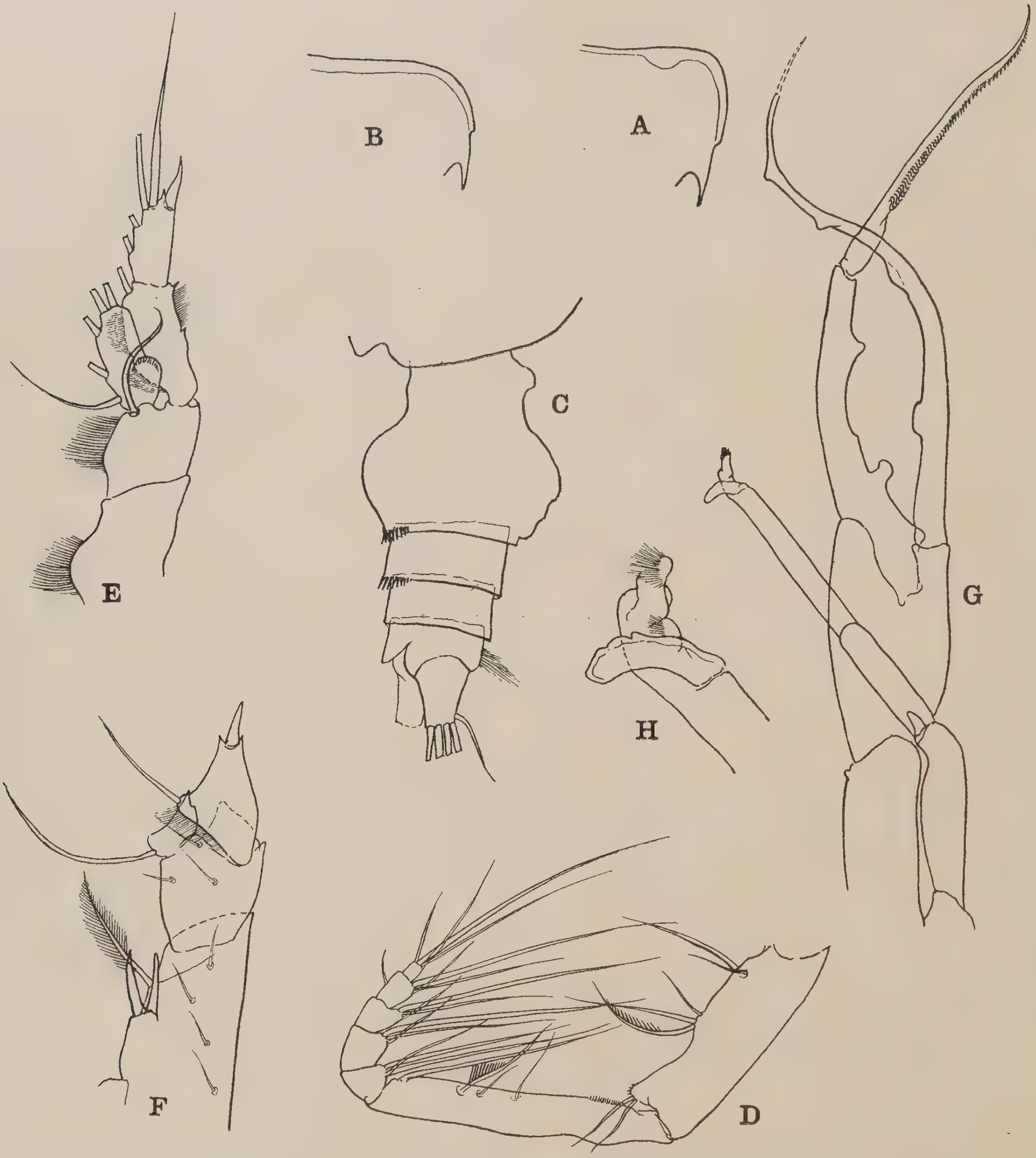
♂. Total length 4·77 mm. These specimens are thus somewhat larger than the females taken at the same stations, but very slightly smaller than the female *orientalis* taken in the Bay of Bengal, that had a length measurement of 4·8 mm.

The proportional lengths of the various segments of the body are as follows:

Cephalon & Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
470	81	81	97	75	56	53	47	6	31 = 1000

The body is considerably more slender than in the female. The forehead (Text-fig. 15, b) is provided with a crest, that very closely resembles that of *E. messinensis* Giesbrecht

(Text-fig. 15, A), but is not so elevated. The rostrum is depressed and is directed vertically downwards. The cephalon and 1st thoracic segment are completely fused. The posterior margin of the thorax is rounded. The 2nd and 3rd abdominal segments are fringed along their posterior margins with a row of triangular spinules. The anal segment is very short and is completely telescoped into the 4th segment; it bears ventrally a tuft of hairs.



Text-fig. 15.—A, *Euchirella messinensis* (Claus), ♂, head, lateral view. B, *Euchirella orientalis* Sewell, ♂, head, lateral view. C, ♀, abdomen, lateral view. D, ♀ Maxilliped. E, ♂, 1st leg. F, ♀, 4th leg. G, ♂, 5th pair of legs. H, ♂, Terminal claw of left 5th leg.

The 1st antenna reaches back to a little beyond the middle of the 2nd abdominal segment. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9–10.	11.	12–13.	14–15.	16.	17.	18.	19.	20–21.	22.	23.	24–25.	
Right	61	41	21	21	21	23	24	69	31	75	48 + 66	65	73	63	65	95	50	42	45	= 1000
Left	59	41	20	21	21	23	24	69	31	76	48 + 65	66	73	63	65	53 45	50	42	46	= 1000

In the left antennule segments 8, 9 and 10 are fused, and so are segments 12 and 13, 14 and 15, and 24 and 25; in the right antennule segments 20 and 21 are also fused.

In the 2nd antenna the endopod is well developed, the proportional lengths of the two rami being as 27 to 38.

As in the other males of this genus the mouth parts are reduced, especially the mandible, which lacks a biting ramus; the 1st inner lobe of the 1st maxilla is also wanting, and the 2nd maxilla is reduced to a fleshy process, with a single segment at the distal end.

The proportional lengths of the two basal segments of the maxilliped are as 32 to 47.

The 1st leg (Text-fig. 15, E) is of the usual type, the exopod consisting of two segments only, and the endopod of one; the proportional lengths of the parts of the exopod are: segment 1–2, 73, segment 3, 54, end-spine 31. There is a very minute spine on the outer margin of the combined 1st and 2nd segment of the exopod, at the distal outer angle of each part; the outer border between these two small spinules is fringed with hairs.

In the 2nd leg the two rami have the usual form, the endopod being composed of a single segment. With has called attention to the presence of an increased number of teeth in the end-spine of this leg, when compared with the more posterior appendages, in *E. messinensis*, which he states is "about 50 instead of 25 teeth"; in the present species the number is 33 instead of 20 as in the 3rd and 4th legs.

The 5th pair of legs (Text-fig. 15, G, H) is of the same type as that found in *E. messinensis*, *pulchra*, *venusta*, *bella* and *amœna*. The endopod of the right leg is of approximately the same length as the two basal segments together. The 2nd basal of the left leg is slightly longer than in *E. venusta* and much longer than in *E. pulchra*; it reaches beyond the distal end of the 1st basal of the right leg. A small endopod is present. The first two segments of the left ramus are of unequal length, the proximal being 20 to the distal 27; the 3rd segment is inserted on the side of the 2nd, so as to form the usual claw. The structure of the two branches of the claw on the right leg differs in detail from that of *E. messinensis*: in the exopod the 1st segment bears at about the junction of the proximal and distal thirds a rounded projection, as in *E. messinensis*, but the 2nd, somewhat smaller projection, just distal to this in *messinensis*, is in this species practically absent. In the endopod there is a rounded prominence on the outer margin just distal to the 1st rounded process of the exopod. The 2nd segment of the endopod bears a large number of transverse lamellæ, about 50 in all, which is many more than are present in *E. messinensis*.

DISTRIBUTION.—Up to the present time this species has only been recorded from the Indian Ocean; it has been taken in the Bay of Bengal (Sewell), the Arabian Sea and the

Gulf of Aden (present records). Its depth range would appear to be from about 400 metres to below 850 metres.

Euchirella pulchra (Lubbock). (Text-fig. 16, A–E.)

Undina pulchra, Lubbock, 1856, p. 26, pl. iv, figs. 5–8, pl. vii, fig. 6.
Euchirella pulchra, Giesbrecht, 1892, p. 233, pl. xv, figs. 22, 23, pl. xxxvi, figs. 13, 27; Esterly, 1905, p. 153, fig. 20; Wilson, 1932, p. 58, fig. 37.
Euchirella orientalis, ♂, Sewell, 1929, p. 118, fig. 44, *d*, *e*.

OCCURRENCE:

Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., vertical, 2 females.
Sta. 172, Central part of the Arabian Sea, 200–0 m., 3 males; 850–0 m., 4 males.
Sta. 186, Gulf of Aden, 575–0 m., 2 males; 600–0 m., 3 males.

DESCRIPTIVE NOTES.—♀. Total length, 3·367 mm.

The proportional lengths of the cephalothorax and abdomen are as 79 to 21. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
396	134	99	84	74	94	36	26	26	31 = 1000

The forehead is rounded and is entirely devoid of a crest; the rostrum is slightly depressed and is directed vertically downwards. The line of separation between the cephalon and the 1st thoracic segment is clearly marked round the whole of the body. The posterior thoracic margin is rounded. In the abdomen (Text-fig. 16, A) the genital segment presents a rounded swelling on the left side and a well-marked ventral protrusion; the posterior margins of the first two segments are fringed dorsally with a row of rather delicate spines.

The 1st antenna reaches back to the end of the thorax. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.
	60	49	23	22	24	23	23	40	29	30	27	47	49	64	61	66	59	63	52	46	46	41	56 = 1000

Segments 8 and 9 and 24 and 25 respectively are fused.

In the 2nd antenna the endopod is very short, and reaches only to a little beyond the middle of the 1st segment of the exopod. The total lengths of the two rami are as 24 to 76, so that the exopod is thus three times the length of the endopod; in the accounts given by previous workers this ramus is stated to be two-and-a-half times the length of the endopod.

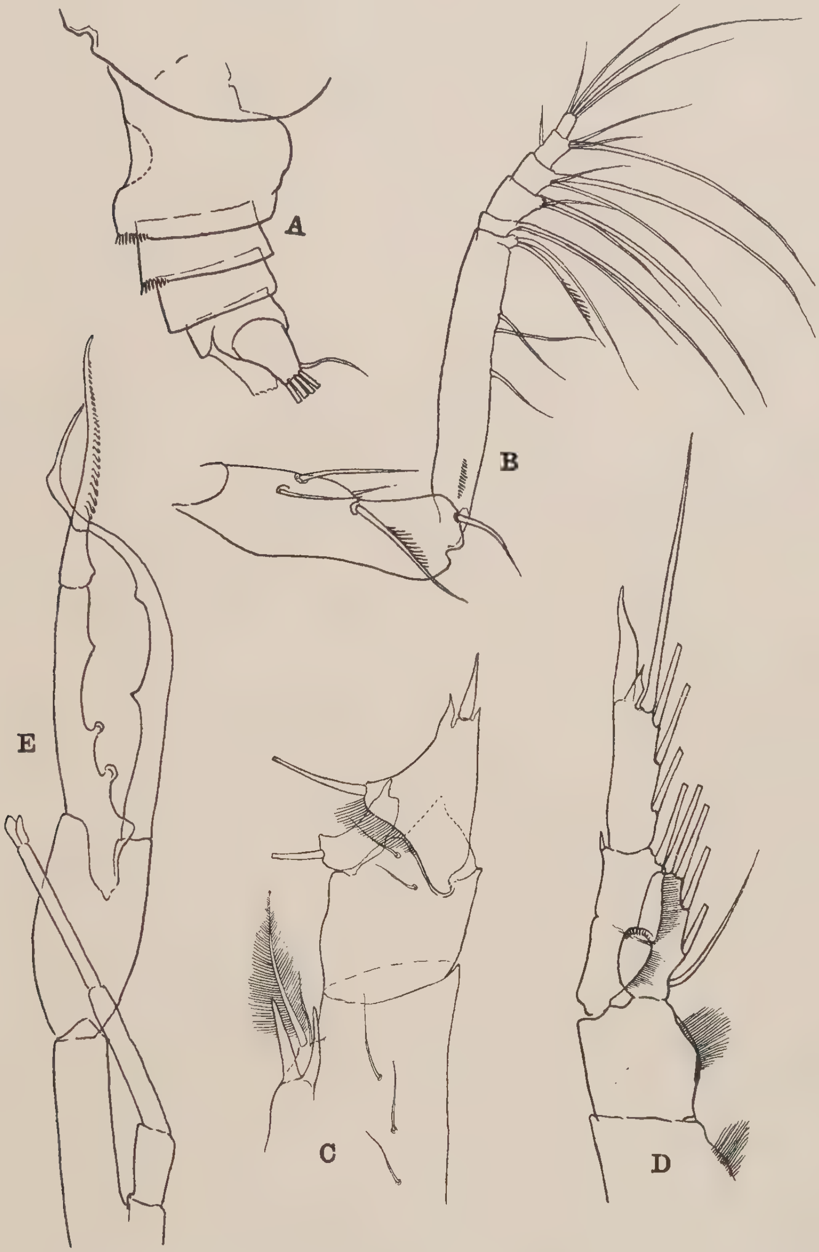
In the maxilla the 2nd inner lobe bears four stout setæ and the 3rd inner lobe two, the 2nd basal segment bears two setæ at its distal inner angle, the proximal of which is delicate, and the endopod bears 4 setæ; the exopod bears 11 setæ and the outer lobe 6.

In the maxilliped (Text-fig. 16, B) the proportional lengths of the two proximal segments are as 48 to 52. The posterior border of the 2nd segment is straight.

♂. Total length, 4·15 mm. This is somewhat larger than the specimen from the Bay of Bengal, described by me as the male of *E. orientalis*, which had a length of 3·7 mm.

The proportional lengths of the various segments of the body are as follows :

Cephalon	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
476		79	79	95	79	60	52	44	8	28 = 1000



Text-fig. 16.—*Euchirella pulchra* (Lubbock). A, Abdomen, lateral view, ♀. B, Maxilliped, ♀. C, 4th leg, ♀. D, 1st leg, ♂. E, 5th pair of legs, ♂.

The forehead is rounded and there is a very low crest ; in my original account I stated that there was no crest, this is incorrect. A very low crest is present, though in some examples it appears to be little more than a linear thickening of the chitin. The 4th and 5th thoracic segments appear to be fused. The anal segment of the abdomen bears a tuft of hairs, but the segment itself is almost completely telescoped into the 4th segment.

The 1st antenna reaches back to about the middle of the 2nd abdominal segment. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9–10.	11.	12–13.	14–15.	16.	17.	18.	19.
Right	65	51	20	22	23	26	28	66	32	72	108	60	68	60	62
Left	62	48	21	21	25	25	26	65	30	71	107	62	67	60	63

Segment	20–21.		22.	23.	24–25.	
Right	91		50	42	54	= 1000
Left	56	43	48	45	55	= 1000

There is thus a close agreement in the lengths of the segments, except where fusion of two or more segments has occurred, with the lengths in the female. In both antennæ the 8th and 9th segments are fused, and to these is fused the 10th ; the 12th and 13th are fused, and so are the 14th and 15th, and the 24th and 25th ; in addition to these the 20th and 21st are fused in the right antennule.

In the 2nd antenna the endopod is well developed and the proportional lengths of the two rami are as 19 to 29. In the exopod the 1st and 2nd segments are separate. The terminal joint of the endopod bears on the inner lobe 6 well-developed setæ, and on the outer lobe 5 well-developed setæ and a sixth small and delicate one.

The 1st leg (Text-fig. 16, D) very closely resembles that of *E. venusta* and *E. orientalis*, but the proportional lengths of the segments and the end spine of the exopod are slightly different ; the proximal joint, consisting of segments 1 and 2, has a length of 42, the 2nd segment 36 and the end-spine 24.

The 5th pair of legs (Text-fig. 16, E) is characterized by the relatively great length of the two basal segments of the right leg, which are together longer than the endopod. In the left leg the 2nd basal segment is very short, and reaches only about half way towards the end of the 1st basal of the right leg. In the right leg the exopod is composed of two segments, the proximal of which is produced in a blunt process near the base, while from the inner margin of the proximal half of the segment arise two processes, lamellar in character with rounded ends, and in the distal half a low pointed process arises at about the junction of the 3rd and 4th quarter. The terminal segment bears a row of about 25 projections, which, as With (1911, p. 124, fig. 31, *c*) has pointed out in the case of *E. messinensis*, are in reality keels, that in optical section appear as teeth.

DISTRIBUTION.—This species occurs in all three great Oceans. In the Pacific it has been taken off the west coast of South America (Giesbrecht), the San Diego region (Esterly), and in the Malay Archipelago (A. Scott). In the Indian Ocean it Occurs off the west coast of Australia (Giesbrecht), and in the Arabian Sea and Gulf of Aden (present records). In the South Atlantic (Wolfenden), the Gulf of Guinea (T. Scott), the North Atlantic (Lubbock, Brady, Thompson), near the Cape Verde and Azores Islands (Sars), in the Gulf of Maine and the Woods Hole region (Bigelow, Wilson).

Euchirella truncata Esterly. (Text-fig. 17, A–E.)

Euchirella truncata, Esterly, 1911 (February), p. 322, pl. xxvi, fig. 5, pl. xxviii, fig. 35, pl. xxix, fig. 63, pl. xxx, fig. 71, pl. xxxi, fig. 104.

Euchirella gracilis, Wolfenden, 1911 (April), p. 237, fig. 22, pl. xxvii, figs. 8–10.

Euchirella intermedia, With, 1915, p. 124, fig. 32, pl. iv, fig. 4, *a–c*, pl. viii, fig. 3 ; Sars, 1925, p. 68, pl. xx, figs. 1–4.

Occurrence :

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female, adult, 1 female juv., ? 1 male juv. ; 1500–0 m., 1 female adult.

Sta. 172, Central part of Arabian Sea, 400–0 m., 2 females, adult.

Descriptive Notes.—♀. Total length, 5·231–5·50 mm. This is smaller than the specimens taken by Esterly, which measured 6·6 mm., by With, that were 5·66 mm., by Sars, that were 6·20 mm., and by Wolfenden, that were 5·6–6 mm. The proportional lengths of the cephalothorax and abdomen are as 4·5 to 1, which agrees closely with With's specimen, in which they were as 4·66 to 1 ; Esterly states that the abdomen is a little more than one-sixth the length of the anterior region. The proportional lengths of the various segments of the body are as follows :

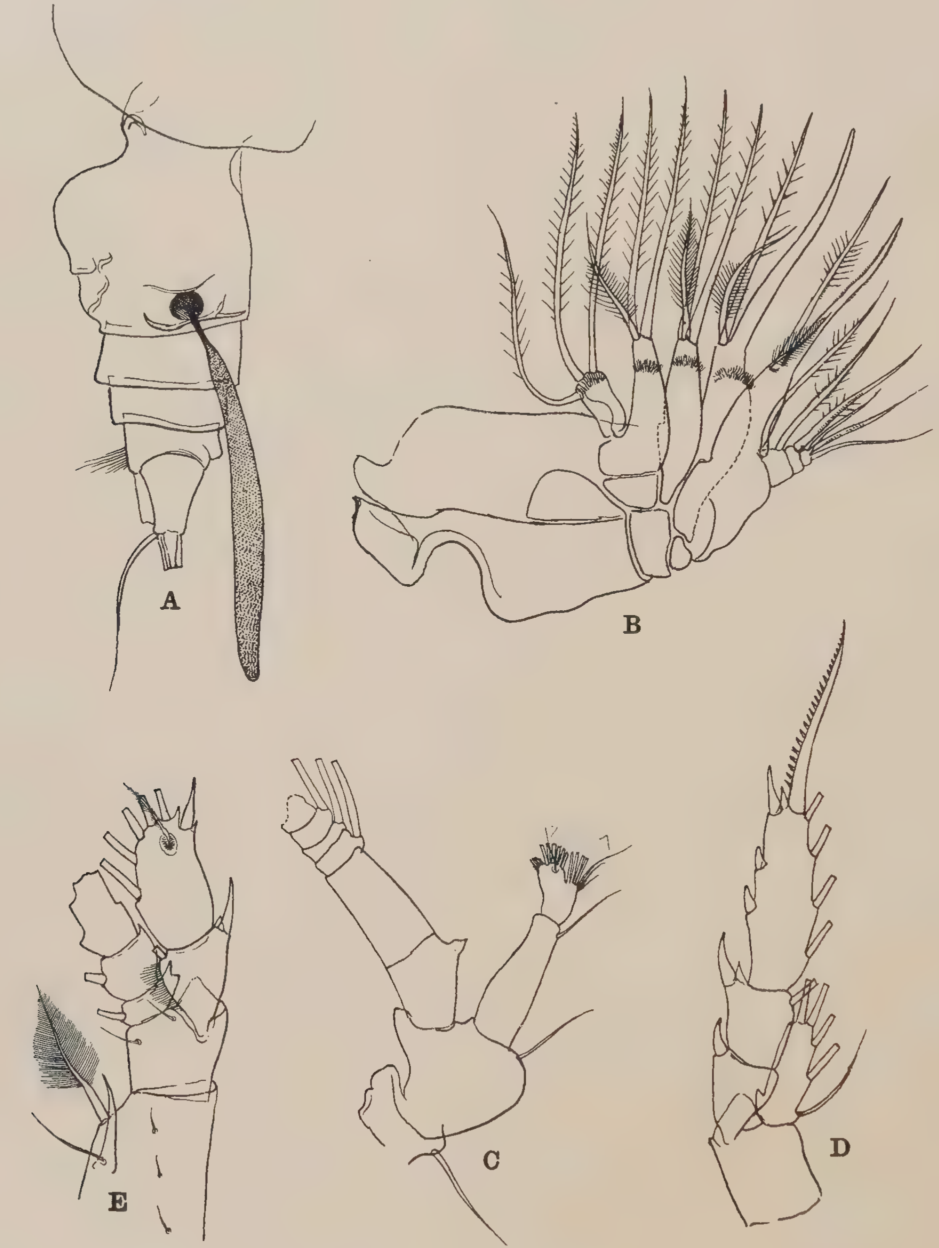
Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
356	161	99	91	85	97	28	22	18	38 = 1000

The line of separation between the cephalon and the 1st thoracic segment is in one specimen quite clear both dorsally and laterally ; in other examples it is only clear in the lateral region, as stated by With. The posterior thoracic margin is rounded, when viewed from the side, but when seen from the dorsal aspect is truncated, as described by Esterly and as clearly figured by Wolfenden. The genital segment (Text-fig. 17, A) is as deep as long and very nearly as wide as long ; it bears a well-developed ridge across the ventral aspect near the anterior margin ; With states that this ridge was not seen by him, and this may perhaps be accounted for by the fact that it lies almost exactly level with the posterior border of the thorax, and thus may have been obscured in his specimen. The left side of the genital segment is more swollen than the right, and behind this swelling there is a depression that is bordered posteriorly by a lamellar ridge ; in two specimens examined by me the head of attachment of a spermatophore was lodged in this depression. The anal segment bears a tuft of hairs ventrally. The furcal rami are as broad as long and are divergent ; they bear at the distal outer angle a short, delicate seta, and distally four plumose setæ of equal length.

The 1st antenna reaches back to about the posterior end of the furcal rami ; there is a slight degree of variation in the different specimens, for in one it only reached to the posterior margin of the 2nd free abdominal segment, whereas in others it seemed slightly to exceed the length of the animal, as stated by Esterly. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25
	60	44	24	22	24	24	24	42	27	30	27	47	49	63	63	67	59	64	60	48	49	38	45 = 1000

In the 2nd antenna (Text-fig. 17, C) the endopod is considerably better developed than in *pulchra*, *venusta*, *bella* or *orientalis*, and reaches nearly to the distal end of the 2nd segment of the exopod. The two proximal segments of the exopod are only partly fused, a faint line of division between them being visible posteriorly. From the anterior margin at about the junction of the proximal and middle thirds of the combined 1st and 2nd segments arises a conical papilla; Wolfenden states that there is a "lappet" on the 2nd segment, but he figures it as present at the distal end of the 1st. With (1915, p. 125) states that there are 9 setæ on each of the lobes of the last segment of the endopod; I have been able to detect only 7 on each.



Text-fig. 17.—*Euchirella truncata* Esterly, ♀. A, Abdomen, lateral view. B, 2nd maxilla. C, 2nd antenna. D, 2nd leg, E. 4th leg, abnormal.

In the 1st maxilla the 2nd inner lobe bears 4 setæ and the 3rd lobe 2, of which one is quite small; the 2nd basal segment bears 2 small and 1 well developed setæ; the endopod bears 5 setæ, of which the inner is very small; the exopod carries 11 setæ and the outer lobe 8, the posterior two being smaller than the others.

In the maxilliped the proportional lengths of the 1st and 2nd basal segments are as 41 to 51, and the posterior margin of the 2nd segment is straight.

The 1st leg has the usual structure. Segments 1 and 2 of the exopod are fused, and this combined joint bears two marginal spines. The proportional lengths of the two segments and the end-spine are as 15, 10 and 10.

In the 2nd leg (Text-fig. 17, D) the external marginal spine of the 2nd segment of the exopod is well developed and is considerably greater than the 1st and 2nd marginal spines of the 3rd segment; it does not, however, as is stated by Wolfenden, reach as far as the base of the 3rd spine of the 1st segment; Wolfenden's illustration of this leg shows that this spine is not quite so long.

The 4th leg bears on its 1st basal segment a single long and moderately stout spine, that reaches to, or nearly to, the end of the segment; immediately distal to the origin of this spine is a delicate seta. A stout plumose seta arises from the distal inner angle. In one specimen (Text-fig. 17, E) the exopod of the 4th leg on one side was represented by a two-jointed short ramus, the length of which was only equal to that of the endopod. The terminal segment carried 5 marginal setæ and a single marginal spine. Probably this abnormality was the result of injury.

DISTRIBUTION.—This species has been recorded from various localities under different names. It has been recorded as *E. truncata* from the San Diego region of the eastern Pacific (Esterly); from the Arabian Sea (present records); from the South Atlantic as *E. gracilis* (Wolfenden); from the North Atlantic by Sars, and from the Atlantic in 51° N. as *E. intermedia* (With).

Euchirella venusta Giesbrecht. (Text-fig. 18, A–G.)

Euchirella venusta, Giesbrecht, 1892, p. 233, pl. xv, fig. 19, pl. xxxvi, fig. 21.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 1 male; 1500–0 m. vertical, 2 females.

DESCRIPTIVE NOTES.—♀. Total length, 4·383 mm.

The proportional lengths of the cephalothorax and abdomen are as 80 to 20. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
386	141	91	84	81	91	34	34	24	34 = 1000

The forehead is rounded and is entirely devoid of a crest. The rostrum is depressed and is directed vertically downwards. The line of separation of the cephalon and the 1st thoracic segment is clearly marked round the whole of the body. The posterior thoracic margin is rounded. In the abdomen (Text-fig. 18, A) there is a rounded prominence on the left side of the genital segment, and a high ridge runs across the ventral part of this segment in front of the genital aperture; the present specimens agree closely with the figure given by Giesbrecht (1892, pl. xxxvi, fig. 21). The posterior margins of the genital and the next following segments are fringed dorsally with a row of spinules. The anal segment bears a tuft of hairs on the ventral aspect.

The 1st antenna reaches back to about the middle of the abdomen. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	58	39	19	20	21	21	21	37	25	29	29	46	51	69	69	74	65	70

20.	21.	22.	23.	24–25.
58	48	45	37	49 = 1000

In the 2nd antenna the endopod is exactly one-quarter the length of the exopod.

In the 1st maxilla the number of setæ on the various lobes appears to be exactly the same as in *E. pulchra* (Lubbock).

In the maxilliped (Text-fig. 18, B) the proportional lengths of the two basal segments are as 42 to 58; the 2nd segment is thus considerably longer in proportion to the 1st segment than in *E. pulchra* (Lubbock). The posterior margin of the 2nd basal segment exhibits a pair of rounded prominences in the distal half of its length.

In the 4th leg (Text-fig. 18, D) the ridge bearing the spines on the postero-inner border is much nearer the distal end of the segment than in *E. pulchra* (Lubbock), so that the tips of the spines are on a level with the distal end of the segment. In most cases there is a pair of spines present, but in one example there were three spines on one side and two on the other.

At the same station, at which the females were obtained, but at a higher level (500–0 metres) a single male was taken that I believe to belong to the same species.

♂. Total length, 3·80 mm.

The proportional lengths of the cephalothorax and abdomen are as 79 to 21. The proportional lengths of the various segments of the body are as follows:

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
484	84	80	96	68	56	48	40	12	32 = 1000

The forehead is rounded and is entirely devoid of any crest. The rostrum is depressed and is directed vertically downwards. There is no trace of any line of separation between the cephalon and the 1st thoracic segment, and segments 4 and 5 also appear to be fused, the 5th segment merely forming a low crest along the lateral part of the region. The 2nd and 3rd segments of the abdomen are armed in the dorsal region with a row of strong triangular spinules. The anal segment bears a tuft of hairs on its ventral aspect; this segment is entirely telescoped into the preceding one.

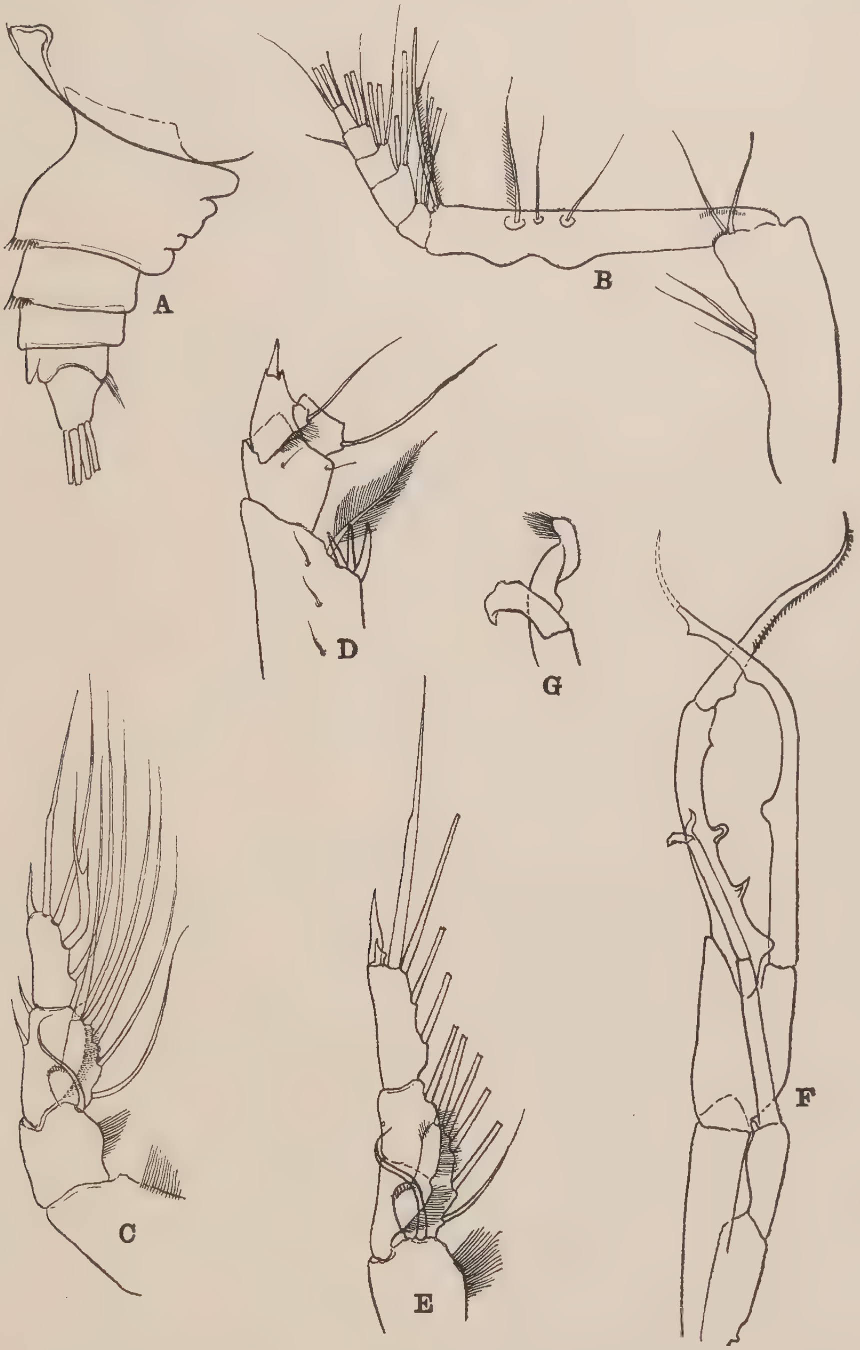
In the 1st antenna on both sides the 8th and 9th segments are completely fused and the 10th is fused to the 9th, though traces of the line of fusion can be detected; the 12th and 13th, and the 14th and 15th segments, respectively, are fused, though traces of the fusion are visible; segments 24 and 25 are fused. In the right antenna segments 20 and 21 are also fused completely.

The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12–13.	14.	15.	16.	17.	18.	19.
Left	68	43	19	17	21	22	23	35	24	25	70	50	62	64	70	64	64
Right	66	46	19	17	21	23	23	37	22	27	69	49	63	63	71	62	66

	20.	21.	22.	23.	24–25.
Left	59	49	52	49	50 = 1000
Right	105		53	48	50 = 1000

In the 2nd antenna the endopod is much better developed than in the female, and the proportional lengths of the two rami are 39 to 61. The exopod in this sex is composed of seven segments, the 1st and 2nd being separate instead of fused. The endopod bears on its two lobes 6 setæ, all well developed, on the inner, and 5 well developed and 1 small and delicate on the outer.



Text-fig. 18.—*Euchirella venusta* Giesbrecht. A, Abdomen, lateral view, ♀. B, Maxillipied ♀. C, 1st leg, ♀. D, 4th leg, ♀. E, 1st leg, ♂. F, 5th pair of legs, ♂. G, Terminal claw of left 5th leg, ♂.

The mandible is devoid of any biting ramus.

The 1st maxilla is also reduced. The 1st inner lobe is reduced to a rounded process without any setæ or spines; the 2nd and 3rd inner lobes are absent; the basal segment bears at its distal end 2 delicate inner setæ and 3 stout outer setæ, these latter apparently corresponding to the setæ that arise from the endopod in the female; the exopod bears 10 stout setæ and the outer lobe has 5 delicate setæ.

The 2nd maxilla is reduced to a fleshy lobe that bears at its extremity a single segment, carrying 5 delicate setæ.

The maxilliped is also somewhat reduced, though all its parts are present. The proportional lengths of the two basal segments are as 36 to 64. The rounded prominence at the distal end of the anterior border of the 1st basal segment is fringed with small spinules.

In the 1st leg (Text-fig. 18, E) the exopod consists of only two segments, segments 1 and 2 being fused, though there is a very small notch in the outer margin and another in the inner border that denote the line of fusion. I was unable to detect any marginal spines on the proximal segment of the exopod. The distal segment is about three-fourths the length of the proximal, and the distal spine is strong and about four-sevenths the length of the segment, the actual proportions being 47, 35 and 20.

The 5th pair of legs (Text-fig. 18, F, G) very closely resemble those of *Euchirella messinensis*. In the left leg the 2nd basal segment does not reach as far as the distal end of the 1st basal segment of the right leg, but is much longer than in *E. pulchra* (Lubbock). There is a very small endopod present. In the exopod the 1st and 2nd two segments are of equal length; the small 3rd segment is inserted a short distance before the end of the 2nd segment, so as to form a minute claw. In the right leg the proportional lengths of the two basal segments are as 34 to 27. The exopod is composed of two segments and the endopod of one. The proximal segment of the exopod is produced in a rounded prominence on its inner side near the base, and on the inner margin are three prominences; the first of these, situated at about one-fourth the length of the segment, is sharply pointed, the second, about half-way along its length, is bluntly rounded, and the third is quite small and is situated near the distal end. The distal segment bears on its inner border a row of about 35 ridges. The inner ramus is S-shaped; it bears on its outer margin, just distal to the 2nd prominence on the exopod, a rounded projection, and at about the junction of the middle and distal thirds a low triangular projection; a still smaller angular projection is present about half-way along the distal third of its length. The total length of the exopod, compared with the total length of the two basal joints, is as 71 to 66.

DISTRIBUTION.—This species would appear to be confined to the Indo-Pacific region. It has been recorded from the west coast of South America (Giesbrecht, Dana), off New Zealand (Farran), in the southern area of the Arabian Sea (present record), and off Cape Colony in the Agulhas Current (Cleve).

"CURTICAUDA" GROUP.

Euchirella maxima Wolfenden. (Text-fig. 19, A–G.)

Euchirella maxima, Wolfenden, 1905, p. 18, pl. vi, figs. 9–11; A. Scott, 1909, p. 57, pl. xii, figs. 12–20; Wolfenden, 1911, p. 238, text-fig. 24, *a*, *b*, pl. xxviii, figs. 3–5; With, 1915, p. 127, text-fig. 33, *a*-*i*, pl. iv, fig. 5, *a*–*h*; Sars, 1926, p. 75, pl. xxii, figs. 1–7; Sewell, 1929, p. 112, text-figs. 42 and 43.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female, 1 male juv.
Sta. 76, Gulf of Oman, 600–0 m., 1 female, 1 male adult, 1 male juv.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female adult, 1 female juv., 1 male adult, 1 male juv.
Sta. 186, Gulf of Aden, 575–0 m., 3 females adult.

DESCRIPTIVE NOTES.—♀. Total length, 7·25 mm.

The proportional lengths of the cephalothorax and abdomen are as 4·8 to 1. The proportional lengths of the various segments are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.-2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
411	137	88	87	83	13	68	32	28	20	33 = 1000

The forehead is crowned by a high crest and the rostrum is small and stout. The cephalon and 1st thoracic segment are fused, but in a stained specimen the line of fusion can still be seen, especially in the lateral region. The 4th and 5th thoracic segments are fused, but the 5th segment forms a rounded lappet on the posterior thoracic margin.

The 1st antenna reaches back to the posterior margin of the genital segment. The proportional lengths of the various segments are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
63	69	27	26	26	25	25	44	29	29	31	43	47	67	64	67	59	54

20.	21.	22.	23.	24–25.
52	42	40	33	40 = 1000

Segments 3, 7, 9, 14, 18, 21, 23, 24 and 25 each bear a long seta.

In the 2nd antenna the 1st basal segment bears a row of long hairs on its inner aspect. The endopod is much reduced and the proportional lengths of the two rami are as 27 to 75. In the endopod the outer lobe of the terminal segment bears 5 setæ that decrease in size outwards, and the inner lobe bears 3 large and 2 small setæ ; this agrees with the accounts given by Wolfenden and A. Scott, but differs from that of With ; this last author seems to have failed to see the two small setæ on the outer lobe. With (*loc. cit.*, p. 127) states that the proximal two segments of the exopod are " well separated " ; in the present specimen they are fused, but the line of fusion is clearly visible. Segment 1 bears, as With has pointed out, a conical process without a seta.

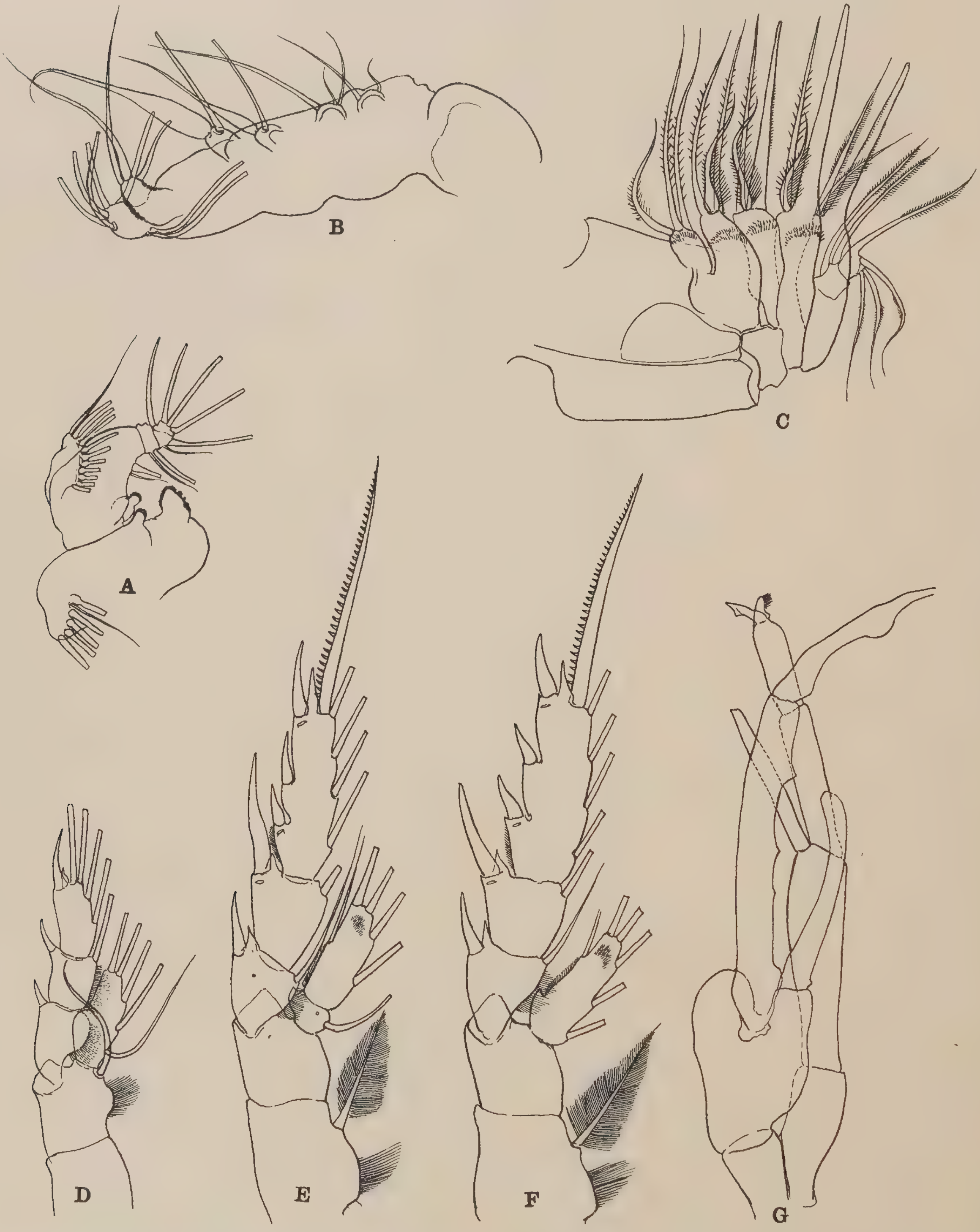
The mandible is furnished with a powerful biting ramus.

In the 1st maxilla the 2nd inner lobe bears four stout setæ, and the 3rd has two small setæ and between them a single large one. The 2nd basal segment bears 2 small and 1 large seta ; the endopod carries 3 large setæ, and the exopod has 11. The outer lobe bears 8 setæ, of which the proximal three and the 5th are smaller than the others.

In the maxilliped the proportional lengths of the two basal segments and the endopod are as 56, 68 and 31. The 2nd basal segment bears, near the proximal end, a band of fine spines, instead of a single row such as is present in *E. bella*, *pulchra*, *truncata*, *venusta*, *orientalis* and *galeata*. In the endopod the 2nd segment bears 4 setæ instead of only 3.

In the 1st leg the fusion of the first two segments of the exopod is complete ; the segment bears two moderately stout marginal spines. The proportional lengths of the two segments and the end spine are as 90, 73 and 43.

♂. Total length, 7·02 mm.



Text-fig. 19.—*Euchirella maxima* Wolfenden. A, 1st maxilla, ♂. B, 2nd maxilla, ♂. C, 2nd maxilla, ♀. D, 1st leg, ♂. E, 2nd leg, ♂. F, 2nd leg, ♀. G, 5th pair of legs, ♂.

The proportional lengths of the cephalothorax and abdomen are as 79 to 21. The proportional lengths of the various segments of the body are as follows :

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
528	77	65	94	50	52	48	37	11	35 = 1000

The cephalon and 1st thoracic segment are fused, and so are the 4th and 5th thoracic segments. The posterior thoracic margin is rounded. Segments 2, 3 and 4 of the abdomen are fringed posteriorly with a palisade of delicate spines. The anal segment is almost completely telescoped into the 4th, and bears a tuft of hairs ventrally.

The 1st antenna reaches back to the posterior margin of the 2nd abdominal segment. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9–10.	11.	12–13.	14–15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.
	74	40	25	24	25	26	27	74	25	60	79	48	52	53	66	61	51	74	61	55 = 1000

In the left antenna segments 8, 9 and 10 are fused, and so are segments 12 and 13, 14 and 15, and 24 and 25 respectively ; in the right antenna segments 20 and 21 are also fused. Segment 3 bears a long seta, but in the more distal segment these are much less well developed than in the female.

In the 2nd antenna the two rami are of approximately equal length. The 1st basal segment bears a row of hairs. The 1st and 2nd segments of the exopod are separate, and the distal segment of the endopod bears 8 and 7 setæ respectively on the two lobes.

The mandible is reduced and the biting ramus is absent.

In the 1st maxilla (Text-fig. 19, A) the three inner lobes are greatly reduced in size and are devoid of any spines or setæ ; the 2nd basal segment bears on its inner margin two very unequal setæ, and beyond this are two distinct segments, of which the first bears on its inner margin two lobes each bearing a proximal small and a distal long seta ; the distal segment is small and bears four setæ. The exopod is well developed and carries 11 setæ, and the outer lobe is also well developed and bears 5 large and 1 small setæ.

The 2nd maxilla (Text-fig. 19, B) is similar to that of *E. curticauda*, as figured by With (1915, pl. iv, fig. 3 *h*).

The maxilliped is comparatively well-developed.

In the 1st leg (Text-fig. 19, D) the exopod is composed of three separate segments each bearing a single marginal spine.

In the 2nd leg (Text-fig. 19, E) the marginal spine of the 2nd segment of the exopod is of remarkable length, and reaches nearly to the distal end of the 2nd spine of the 3rd segment ; in this respect this specimen appears to differ radically from the one examined by With, for he remarks (1915, p. 129) on the " comparatively short Se Re II." In this sex the endopod is composed of two segments, segment 1 being clearly separated off.

The 5th pair of legs (Text-fig. 19, G) resembles in its general form the corresponding appendage of *E. curticauda*, *E. rostrata* and *E. rostromagna*. With (1915, p. 120) states that the 5th leg of *E. curticauda* " shows similarity not only to that of *E. messinensis* but also to that of *E. rostrata*," but he seems to have overlooked certain essential differences in the two types of limb, and the 5th leg of *E. maxima* agrees well with the type found in the three above-mentioned species, and differs essentially from the type present in *E. messinensis*, *bella*, *orientalis* and *pulchra*. There appear to be certain minor differences in the legs of the present form and that of the examples described by With and Sars.

DISTRIBUTION.—This species has now been taken in the Malay Archipelago (A. Scott), the Bay of Bengal and the Laccadive Sea (Sewell), the Arabian Sea and the Gulf of Aden (present records), the South Atlantic as far as 36° S. (Wolfenden), the North Atlantic (Sars), the west coast of Ireland (Farran), and the North Atlantic as far north as 61° N. (With).

Genus *Chirundina* Giesbrecht.

Chirundina, Giesbrecht, 1895, p. 249.

Chirundina indica Sewell. (Text-fig. 20, A–E.)

Chirundina indica, Sewell, 1929, p. 119, text-figs. 45, *a*, *b*, and 46, *a–j*.

OCCURRENCE :

Sta. 96, Central part of Arabian Sea, 645–400 m., 12 females, adult, 2 juv.; 1 male, juv.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., 2 females, adult; 1 male, adult.
Sta. 145 C, Maldive area, 500–0 m., 3 females, adult.
Sta. 145 D, Maldive area, 300–0 m., 3 females, adult; 1 male, juv.; 500–0 m., 2 females, adult.
Sta. 172, Central part of Arabian Sea, 400–0 m., 23 females, adult; 850–0 m., 63 females, adult.
Sta. 186, Gulf of Aden, 575–0 m., 6 females, adult; 950–0 m., 44 females, adult.

DESCRIPTIVE NOTES.—♀. Total length ranging from 4·05 to 5·00 mm., the average being 4·60 mm. This species is thus slightly smaller than *Chirundina streetsi*, which ranges from 4·8 to 5·3 mm.

The proportional lengths of the cephalothorax and abdomen are as 79 to 21, or 3·8 to 1. In my earlier account of this species I gave the proportional lengths as 4·7 to 1.

The fusion of the cephalon and 1st thoracic segment is not quite complete, the line of fusion being visible in the mid-dorsal line, as in *C. streetsi*, but slightly more extensively.

The proportional lengths of the various segments of the body are as follows :

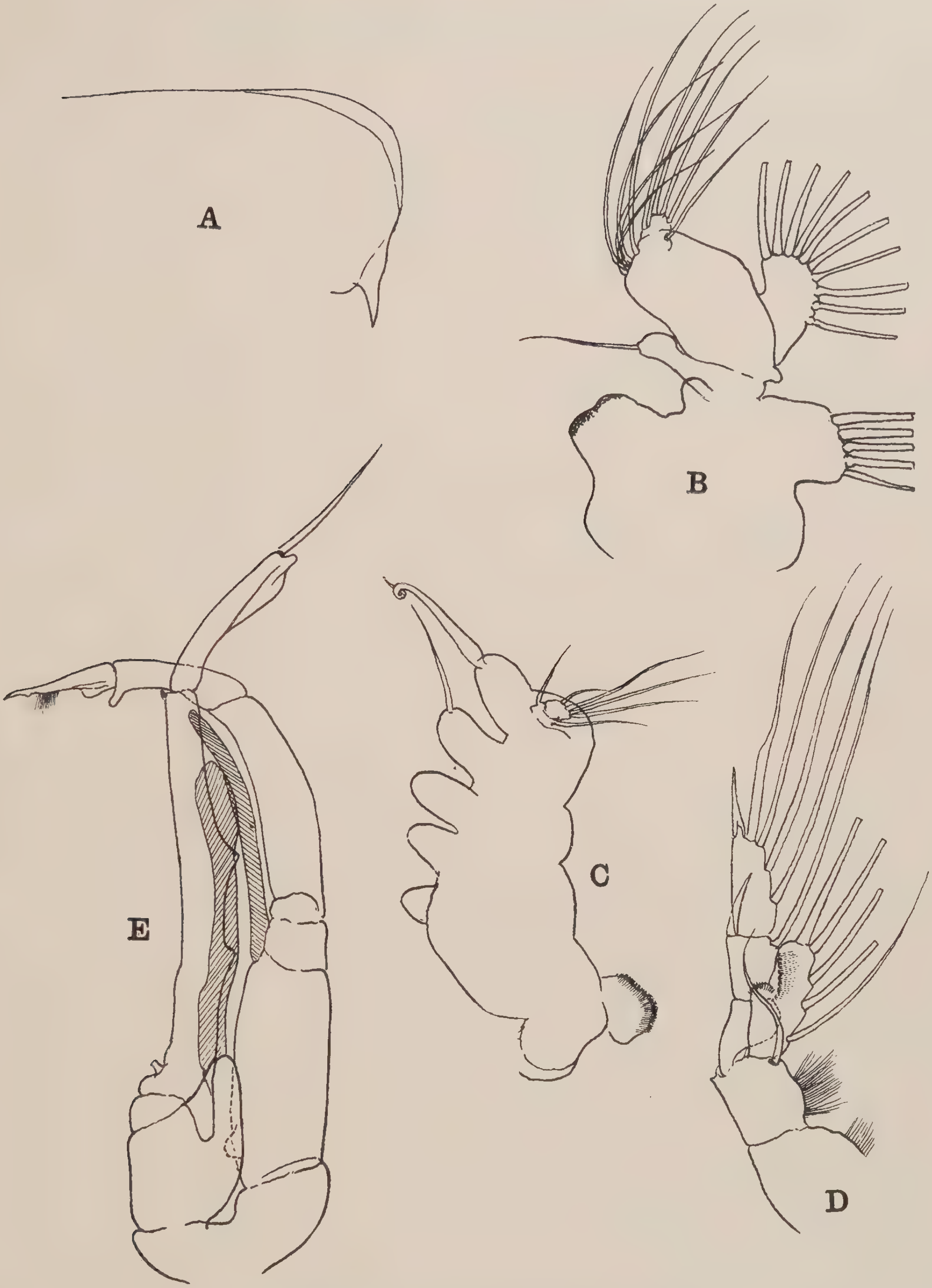
Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
$\underbrace{519}_{374 \quad 145}$	94	81	67	101	47	34	20	37 = 1000

The proportional lengths of the various segments of the 1st antenna are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
64	47	27	26	30	30	32	48	29	31	26	45	44	51	51	54	49	68

20.	21.	22.	23.	24–25.
58	41	47	51	51 = 1000

There is thus little or no difference between this and the preceding species.



Text-fig. 20.—*Chirundina indica* Sewell, ♂. A, Frontal region, lateral view. B, 1st maxilla. C, 2nd maxilla. D, 1st leg. E, 5th pair of legs.

The mouth parts appear to be identical with those of *C. streetsi.*

As I have previously pointed out, the 1st leg differs from that of *C. streetsi* in that the proximal segment of the exopod, which is partly fused with the 2nd segment, is devoid of any marginal spine.

Associated with the two females of this species and one of *C. streetsi* at Sta. 131 D, 1500–0 m., was a single adult male, which I believe to be the hitherto unknown male of this species.

♂. Total length, 3·967 mm.

With gives the total length of the male of *C. streetsi* as 3·80 mm., and A. Scott's specimen from the Malay Archipelago measured 4·1 mm. The proportional lengths of the various segments of the body are as follows:

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
494	91	77	73	57	69	57	45	8	29 = 1000

The forehead (Text-fig. 20, A) is crowned by a small, and somewhat inconspicuous crest, considerably smaller than in *C. streetsi.*

In the 1st antenna the proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9–10.	11.	12–13.	14.	15.	16.	17.	18.	19.
Right	72	46	23	22	26	26	28	70	31	69	43	51	54	57	50	67
Left	71	46	22	21	26	26	30	71	30	71	43	51	54	56	51	67

Segment	20.	21.	22.	23.	24–25.	
Right	100		55	57	53	= 1000
Left	61	42	54	56	51	= 1000

Segments 8 and 9 are completely fused and 9 is almost completely fused with 10, only a trace of the line of fusion being visible; segments 12 and 13 are also fused; in addition to these, in the right antenna segments 20 and 21 are fused. According to With (1915, p. 143) in *Chirundina streetsi* segments 20 and 21 are separate in both antennæ.

In the 2nd antenna the 1st basal segment bears a row of hairs. The proportional lengths of the endopod and exopod are as 3 to 4. The distal segment of the endopod carries on the outer lobe 8 well-developed setæ, and on the inner 5 well-developed setæ and 3 much smaller ones, the innermost being minute. In the exopod the two proximal segments are separate, and the 1st bears a prominence that is devoid of any seta; With (1915, p. 143) states that in *C. streetsi* the 2nd segment bears "2 basal processes and a single terminal one," but I could only detect a single process close to the proximal border in the present specimen.

The mandible is devoid of a biting ramus, but the palp is well developed.

In the 1st maxilla (Text-fig. 20, B) the 1st inner lobe is represented by a rounded process. The 2nd inner lobe is very small and is devoid of any setæ. The 3rd inner lobe is moderately well formed and bears a single seta. The 2nd basal segment and the endopod together bear 10 or 11 small setæ. The exopod carries 10 well-formed, long flexible setæ, and the outer lobe bears 5 long setæ.

The 2nd maxilla (Text-fig. 20, C) is much reduced. It bears 5 lobes, of which the proximal three are devoid of any setæ and the 4th and 5th bear one each. The terminal portion bears 6 very small setæ.

The maxilliped is moderately well developed.

In the 1st leg (Text-fig. 20, D) the exopod is composed of three segments, segments 1 and 2 being separate; the proximal segment is, however, entirely devoid of a marginal spine or seta, thus resembling the female and differing from the male of *C. streetsi*, which possesses a short marginal spine on this segment.

The 2nd–4th legs resemble those of the female.

The 5th pair of legs (Text-fig. 20, E) appears to be almost identical with those of *C. streetsi*.

DISTRIBUTION.—Up to the present time this species has only been recorded from the Laccadive Sea (Sewell), the Arabian Sea and the Gulf of Aden (present records).

Chirundina streetsi Giesbrecht.

Chirundina streetsi, Giesbrecht, 1895, p. 250, pl. i, figs. 5–10; Esterly, 1906, p. 59, pl. ix, fig. 2, pl. x, fig. 28, pl. xii, fig. 58, pl. xiv, figs. 86, 87; A. Scott, 1909, p. 43, pl. xii, figs. 1–11; Sars, 1925, p. 77, pl. xxii, figs. 8–13.

OCCURRENCE:

Sta. 96, Central part of Arabian Sea, 645–400 m., 4 juv.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., 1 female, adult.
Sta. 145 D, Maldive area, 300–0 m. vertical, 1 juv.; 500–0 m. vertical, 1 juv.
Sta. 172, Central part of Arabian Sea, 850–0 m., 9 juv.

DESCRIPTIVE NOTES.—♀. Total length, 5·35 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 to 24. The proportional lengths of the various segments of the body are as folllows:

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
526	108	87	57	90	46	34	18	34 = 1000

The cephalon and 1st thoracic segment are fused but, as pointed out by With (1915, p. 141), a trace of segmentation can be seen in the mid-dorsal line. The 4th and 5th thoracic segments are fused, and in the present specimen the posterior margin presented the form shown by Giesbrecht (1895, pl. i, fig. 10), and With (1915, fig. 38, *d*), being produced backwards in a wing-like, rounded prominence crowned by a small papilla. The genital segment is produced in a prominence ventrally with a well-marked ridge anterior to the genital aperture, from which the profile slopes gradually downwards to the posterior margin. The 3rd free (4th) segment is fringed along the posterior margin dorsally with a double row of needle-like spinules. The anal segment bears a tuft of hairs on its ventral aspect.

The 1st antenna extends backwards as far as the furcal rami. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	68	46	27	27	30	32	31	47	29	30	26	44	43	51	52	57	49	68

20.	21.	22.	23.	24—25.	
61	40	44	50	48	= 1000
				39 9	

The 8th and 9th segments are fused and so are the 24th and 25th, though in the present specimen the fusion appears to be incomplete.

In the 2nd antenna the proportional lengths of the exopod and endopod are as 42 to 23. The proximal two segments of the exopod bear, as pointed out by With, setæ that arise from papillæ, one on the proximal segment and three on the 2nd segment.

The 1st maxilla agrees with the description given by Giesbrecht.

In the maxilliped the proportional lengths of the two basal segments and the endopod are as 40, 63 and 17. The elongate 2nd basal segment bears a long linear lamella on its posterior border, the central portion being somewhat emarginate.

The 1st leg, as pointed out by Giesbrecht, has a two-jointed exopod, the segmentation between the 1st and 2nd segments being incomplete; the 1st segment bears a slender, seta-like marginal spine.

Distribution.—In the Pacific Ocean off the coast of California in the San Diego region (Esterly), in lat. 35° N., long. 125° W. (Giesbrecht), off New Zealand (Farran) and in the Malay Archipelago (A. Scott). In the Indian Ocean from the Maldive area, the central and southern areas of the Arabian Sea (present records), and from the Agulhas current off Cape Colony (Cleve). In the Atlantic Ocean from the southern region (Wolfenden), in the North Atlantic (Wolfenden, Sars, van Breemen, Lysholm and Nordgaard, Rose), the Bay of Biscay and the west coast of Ireland (Farran), off the east coast of North America in the Gulf of Maine (Bigelow) and the Woods Hole Region (Wilson), and South of Iceland, as far north as lat. 63° 30· N′ (With).

Genus *Pseudochirella* Sars.

Pseudochirella, Sars, 1920, p. 5; *id.*, 1925, p. 83; Sewell, 1929, p. 127.

A number of species that had previously been referred to other genera have been transferred by Sars to this genus, and several other species described by other authors should, in my opinion, be included here. I give below a list of the species that I believe should be ascribed to this genus.

Pseudochirella calcarata Sars.
P. cryptospina Sars (= *Gaidius parvispina* Farran).
P. dentata A. Scott.
P. divaricata Sars.
P. dubia Sars.
P. elongata (Wolfenden), from *Euchirella.*
P. fallax Sars.
P. granulata (A. Scott), from *Euchirella.*
P. hirsuta (Wolfenden), from *Euchirella.*
P. lobata Sars.
P. magna (Wolfenden), from *Chirundina.*
P. notacantha Sars.
P. obesa Sars.
P. obtusa Sars (= *Chirundina abyssalis* With, *Euchirella dubia* A. Scott).
P. palliata Sars.
P. pustulifera Sars (= *Euchirella wolfendeni* Farran).
P. scopularis Sars.
P. spinosa (Wolfenden), from *Euchirella.*
P. superba (With), from *Undeuchæta.*

Pseudochirella magna (Wolfenden). (Text-fig. 21, A–C.)

Chirundina magna, Wolfenden, 1911, p. 241, text-fig. 27, pl. xxviii, figs. 10–13.
Pseudochirella magna, Sewell, 1929, p. 129, fig. 49, *a*, *b*.

OCCURRENCE :

Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female.
Sta. 145 C, Maldive Area, 500–0 m. vertical, 1 juv.
Sta. 145 D, Maldive Area, 300–0 m. vertical, 1 juv.

DESCRIPTIVE NOTES.—♀. Total length, 8·0 mm.

This is considerably larger than the specimens originally taken by Wolfenden in the central and southern part of the Atlantic, which measured 6·0–6·6 mm. in length, or those taken by the "Investigator" in the Laccadive Sea, which were 6·2 mm. in length. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
386	171	89	83	73	83	30	29	14	41 = 1000

The forehead (Text-fig. 21, A) bears a short median crest. The cephalon and 1st thoracic segments are fused, but the line of fusion can be clearly seen in the stained specimen. The 4th and 5th thoracic segments are fused, and the posterior thoracic margin is emarginate in the dorso-lateral region and rounded posteriorly.

The genital (Text-fig. 21, B) segment is produced ventrally in a rounded swelling. The anal segment bears a tuft of hairs on the ventral aspect.

The 1st antenna over-reaches the furcal rami by about the last three segments. Wolfenden, in his original account of this species, states that this appendage over-reaches the furca by the last 4 or 5 segments. The proportional lengths of the various segments are as follows :

Segment.	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	61	37	19	19	23	24	24	44	23	24	24	37	39	48	49	56	56	73	69	56	77	61	38	19 = 1000

The line of separation between the 12th and 13th segments appears to be less complete than the others ; segments 24 and 25 are separate.

In the 2nd antenna the 1st basal segment bears a row of hairs. The proportional lengths of the endopod and exopod are as 32 to 52. The endopod bears 6 setæ on each of the two lobes of the terminal segment, and these setæ are comparatively small and delicate. The setæ arising from the exopod are very long and plumose.

The biting ramus of the mandible is powerful, and the setæ of the palp are long and plumose.

In the 1st maxilla the setæ arising from the various lobes, etc., are as follows :

From	Inner Lobe 1,	14 stout setæ.
,,	,, 2,	4 setæ.
,,	,, 3,	4 ,,
,,	Basal 2,	3 ,,
,,	the Endopod,	3, 3 and 5 setæ.
,,	Exopod,	11 setæ.
,,	Outer lobe,	9 ,,

In the 2nd maxilla the basal segment bears on its posterior margin a nipple-like prominence. The number of setæ arising from the various lobes are as follows :

From Lobe 1, 3 setæ.
,, ,, 2, 3 ,,
,, ,, 3, 3 ,,
,, ,, 4, 3 ,,
,, ,, 5, 3 ,,
,, Endopod, 2, 1 and 3 setæ from the various segments.

In the maxilliped (Text-fig. 21, c) the proportional lengths of the two basal segments are as 46 to 65.

The rounded prominence at the distal end of the 1st basal segment bears very fine spinules ; it is not smooth as I previously stated (1929, p. 130). From this lobe arise three setæ and a forwardly-directed nipple-like prominence, which bears a very small blunt process.

The 1st and 2nd swimming legs agree exactly with the descriptions given by Wolfenden (*loc. cit.*).

The 4th pair of legs bears, as I have previously noted, a row of 13 fine needle-like spines on the 1st basal segment.

Distribution.—This species has now been recorded from the Laccadive Sea (Sewell), the Maldive Area and the central part of the Arabian Sea (present records), and from the equatorial and southern regions of the Atlantic Ocean.

? *Pseudochirella notacantha* Sars. (Text-fig. 21, d.)

Gaidius notacanthus, Sars, 1905, p. 5 ; Farran, 1908, p. 33, pl. iii, fig. 7.
Chirudina notacantha, With, 1915, p. 148, text-fig. 41 *a–k*, pl. v, figs. 7 *a*, *b*, pl. vi, figs. 1 *a*, *b*.
Pseudochirella notacantha, Sars, 1925, p. 86, pl. xxiv, figs. 7–12 ; Farran, 1929, p. 232 ; Jespersen, 1934, p. 66.

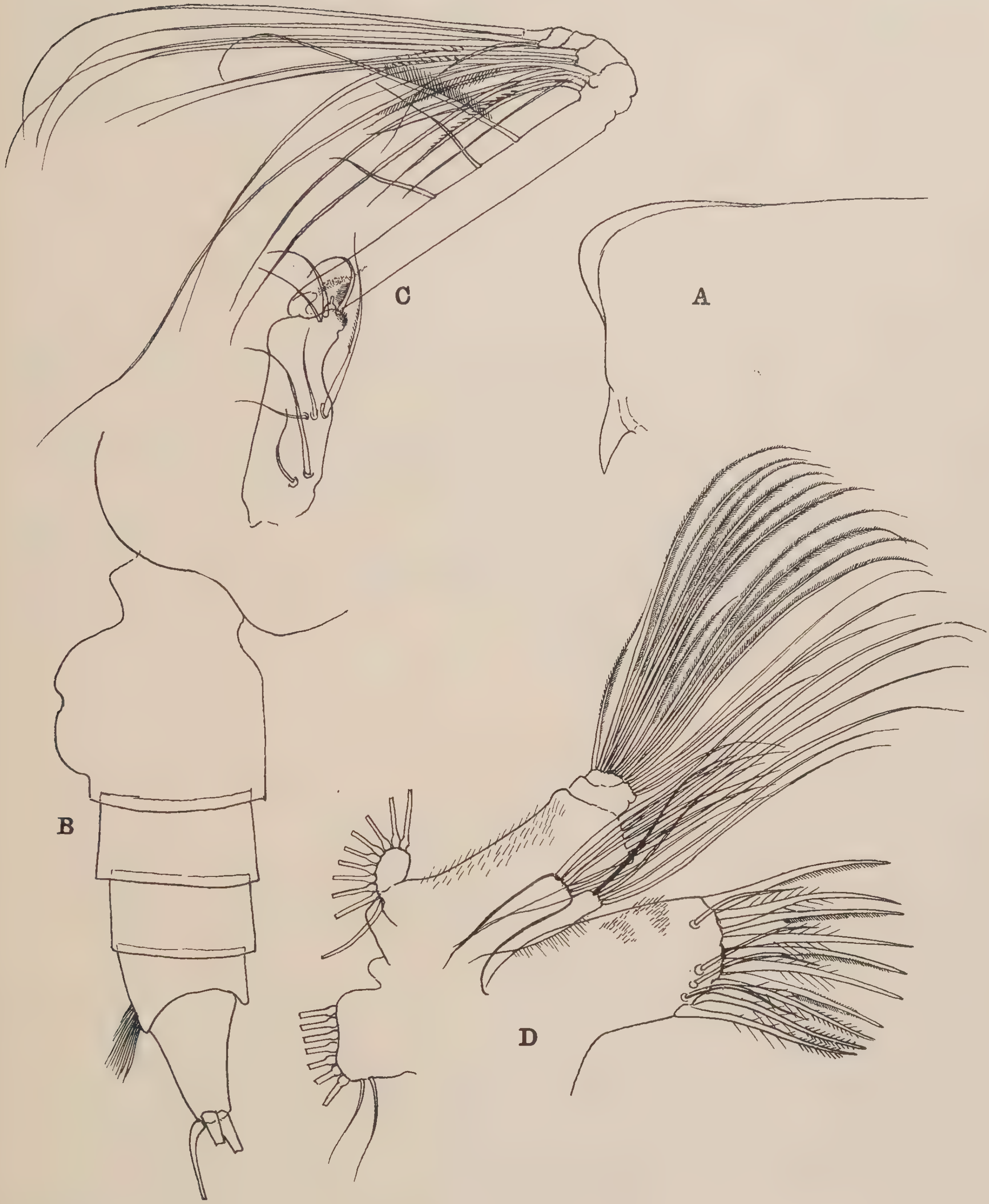
Occurrence.—Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 female (immature).

Descriptive Notes.—Copepodid Stage V, ♀. Total length, 4·484 mm.

The proportional lengths of the cephalothorax and abdomen are as 79 to 21. The abdomen consists of only four segments, segments 4 and 5 still being fused. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
412	158	89	75	45	14	51	48	37	37	34 = 1000

The dorsal profile slopes gradually down to the extreme anterior end, and the rostrum is stout and is directed downwards and slightly backwards. The cephalon and 1st thoracic segments are still separate, though fusion appears to have begun ; during the process of dissecting the specimen the cuticle split across the body along the line of separation between the two regions. The posterior thoracic margin is produced backwards in a stout spine that reaches to about three-fourths of the 1st abdominal segment ; immediately below the spine the posterior margin forms a wing-like flap. The 2nd and 3rd abdominal



TEXT-FIG. 21.—*Pseudochirella magna* (Wolfenden), ♀. A, Frontal region, side view. B, Abdomen, lateral view. C, Maxilliped. *Pseudochirella notacantha* Sars, ♀. D, 1st maxilla.

segments are hairy on the dorsal surface. A tuft of hairs arises from the ventral aspect of the anal segment, and the dorsal aspect of the furcal rami bear some long hairs. The 1st antenna reaches back to the posterior margin of the 3rd abdominal segment. The proportional lengths of the various segments are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12–13.	14.	15.	16.	17.	18.	19.
75	47	27	26	29	29	29	46	28	29	71	39	48	49	53	44	67

20.	21.	22.	23.	24.	25.
63	43	50	54	42	12 = 1000

Segments 8 and 9 are completely fused, and 12 and 13, apparently, are partially so ; segments 24 and 25 also are partially fused.

In the 2nd antenna the proportional lengths of the endopod and exopod are as 25 to 42. Of the terminal lobes of the 2nd segment of the endopod, the inner bears 7 setæ and the outer 6. In the exopod the 1st and 2nd segments are separate, and I was able to detect the short process on segment 1, which With states is present. Segment 2 bears a small seta distally. The 1st basal segment bears a row of hairs.

The mandible possesses a strong biting ramus, the anterior tooth of which is elongate and sickle-shaped, as in *P. obtusa*.

In the 1st maxilla (Text-fig. 21, D) the various lobes bear the following number of setæ :

Inner Lobe	1,	15.
,,	2,	5.
,,	3,	4.
2nd basal,		5.
Endopod,		4, 4 and 7.
Exopod,		10.
Outer Lobe,		7, plus 2 smaller posterior ones.

In the maxilliped the proportional lengths of the various segments are as 42, 65 and 21, so that the 2nd basal segment is 1·55 times as long as the proximal segment, and 3·1 times the length of the endopod.

The 1st leg agrees with the description given by With (*loc. cit.*, p. 149).

In the 2nd leg the endopod is composed of a single segment, that shows no trace of any division into two segments.

The number of teeth on the terminal spine of the exopod of the 3rd leg is considerably less than in the 2nd and 4th legs, and these teeth are larger and coarser ; in the 2nd and 4th legs this spine bears 57 or 58 teeth, whereas in the 3rd leg there are only 42.

The basal segment of the 4th leg is devoid of any row of spines, and is even without a row of hairs on its inner margin.

DISTRIBUTION.—This species has now been recorded from the Antarctic (lat. 66° 30′–76° S. (Farren), the Arabian Sea (present record), the North Atlantic Ocean (Sars), the west coast of Ireland (Farren), south of Iceland (lat. 60° 30′ N., long. 17° 08′ W.) (With) and in Davis Straits, W. Greenland (Jespersen).

Pseudochirella obtusa Sars.

Undeuchæta obtusa, Sars, 1905, p. 13; Lysholm and Nordgaard, 1921, p. 17.
Pseudochirella obtusa, Sars, 1925, p. 83, pl. xxiv, figs. 1–4; Sewell, 1929, p. 131, text-fig. 50, *a–d*.
Euchirella dubia, A. Scott, 1909, p. 60, pl. xiv, figs. 1–7.
Chirudina abyssalis, With, 1915, p. 147, text-fig. 40, *a–c*, pl. v, figs. *a–f*.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female, adult.

DESCRIPTIVE NOTES.—♀. Total length, 5·75 mm.

This agrees closely with the size of Sars's specimens from the North Atlantic Ocean, which measured 5·8 mm. A. Scott gives the length of his specimens from the Malay Archipelago as 7·0 mm. The proportional lengths of the cephalothorax and abdomen are as 78 to 22. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
397	135	88	73	50	31	91	50	35	21	29 = 1000

The line of fusion of the cephalon and 1st thoracic segment is clearly visible in stained specimens and the fusion appears to be incomplete dorsally.

The rostrum is a stout single process that is slightly curved posteriorly. The forehead is devoid of any crest. The 4th and 5th thoracic segments are separate and the posterior thoracic margin is rounded. The genital segment is symmetrical; on either side about the middle of its length there is a slight rounded protuberance. All the abdominal segments are hairy. The furcal rami are as broad as long.

The 1st antenna reaches back to the anal segment. The proportional lengths of the various segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
67	42	27	27	29	31	31	49	28	28	28	45	45	50	52	55	49	65

20.	21.	22.	23.	24.	25.
61	42	49	51	38	11 = 1000

The 8th and 9th segments are fused, but the 24th and 25th are, at least partially, separate.

In the 2nd antenna the endopod is well developed, and the proportional lengths of the two rami are as 28 to 47; the endopod thus reaches to a little beyond the middle of the length of the exopod. Segments 1 and 2 of the endopod are separate. There is a row of hairs on the 1st basal segment.

In the mandible the biting ramus is well developed and the most anterior tooth is elongate and sickle-shaped. The 2nd basal segment bears three setæ, of which the proximal is much the stoutest.

In the 1st maxilla the 2nd inner lobe bears 5 setæ and the 3rd carries 4; the 2nd basal segment bears 4 setæ and the endopod 15 (4 + 4 + 7); the exopod bears 11 setæ and the outer lobe 9, the proximal two being small and delicate.

In the maxilliped the proportional lengths of the two basal segments are as 5 to 8. The anterior margin of the 1st basal segment is produced distally in a bluntly rounded eminence that is covered with small spinules; on the distal border is a nipple-like prominence, similar to that present in *C. notacantha*.

In the 4th leg there is a considerable degree of variation in the number of spines arising from the 1st basal segment, to which I have already called attention (*vide* Sewell, 1929, p. 132). In the present specimen there were 6 spines on one side and 8 on the other. The range of variation thus seems to extend from 6 in the present specimen to 13 (*vide* Jespersen, 1934, p. 65).

Distribution.—This species would appear to have a wide distribution. A. Scott has recorded it (as *Euchirella dubia*) from the Malay Archipelago; I have recorded it from the Laccadive Sea, and the present record extends its distribution in the Indian Ocean to the Arabian Sea. Sars and Rose have recorded it from the North Atlantic Ocean, Farran off the west coast of Ireland, Lysholm and Nordgaard (as *Undeuchæta obtusa*) from lat. 56° N., With (as *Chirudina abyssalis*) from the North Atlantic as far as lat. 61° 30′ N., and Jespersen from the waters south of Davis Strait.

Genus *Undeuchæta* Giesbrecht.

Undeuchæta, Giesbrecht, 1888, p. 335; 1892, p. 54.

As I have previously pointed out (Sewell, 1929, p. 123), a number of species have from time to time been referred to this genus, and have subsequently been removed; at present the various forms that can definitely be placed in this genus are as follows:

Undeuchæta australis (Brady).
U. bispinosa Esterly.
U. incisa Esterly.
U. intermedia A. Scott.
U. major Giesbrecht.
U. minor Giesbrecht.
U. plumosa (Lubbock).

Some of the above are undoubtedly synonyms. As Sars (1925, p. 81) has pointed out, *Undeuchæta minor* Giesbrecht (1892) is indubitably the same as the form previously described by Brady (1883) under the name *Euchæta australis*, and A. Scott (1909, p. 62) has called attention to the fact that *Undeuchæta plumosa* (Lubbock, 1856), described from the male, is a synonym of the same form; thus the correct name of the species must be *Undeuchæta plumosa* (Lubbock). It also appears to me highly probable that *Undeuchæta incisa* Esterly (1911, p. 319) is identical with the form described by With (1915, p. 137) under the name *Undeuchæta superba*, but Esterly's account is very incomplete; if this be so, then this species must be transferred to the genus *Pseudochirella*, to which Jespersen has already transferred With's species. It seems to me by no means improbable that the species described by Wolfenden (1911, p. 244, pl. xxix, figs. 4–7) under the name *Mesundeuchæta asymmetrica* will also eventually prove to be the same species. In the presence of a crest, the asymmetrical development of the posterior thoracic margins and the presence of a prominence on the right side of the genital segment, it agrees with the accounts of *Undeuchæta incisa* and *U. superba*. With (1915, p. 141) has pointed out that the reasons adduced by Wolfenden for the creation of a new genus are quite insufficient.

A. Scott (1909, p. 61) has expressed the opinion that the male described by Thompson (1903, p. 21, pl. iii, figs. 1–5) under the name *Scolecithrix cristata* Giesbrecht is in reality the male of *Undeuchæta major* Giesbrecht, and With (1915, p. 137) accepts and agrees with this view: it seems to me, however, that both these authors are wrong. Sars (1925, p. 81) has described and figured the true male of *U. major*, and Thompson's male appears to me to be the male of *Euchirella curticauda* Giesbrecht.

At the present time this genus thus includes five species that can be separated into two groups as follows:

1. Those in which a frontal crest is present, and the genital segment of the female is devoid of any spine or rod-like projection in the dorso-lateral region on the right side.

    Undeuchæta major Giesbrecht.
    Undeuchæta incisa Esterly (= *U. superba* With).

2. Those in which the frontal crest is reduced to a mere trace or is altogether absent, and a spine or rod-like projection is present in the dorso-lateral region of the right side of the genital segment in the female.
    (*a*) There is a trace of a frontal crest, and a spinous projection is present on the right side of the genital orifice of the female:

    Undeuchæta intermedia A. Scott.

    (*b*) There is no spinous projection on the right side of the genital aperture of the female:
    Undeuchæta plumosa Lubbock (= *U. australis* (Brady) and *minor* Giesbrecht).

    (*c*) A spinous projection is present on the right side of the genital orifice of the female and a smaller spine on the left side of the orifice:

    Undeuchæta bispinosa Esterly.

The genus would appear to be primarily an Indo-Pacific one, for no less than four of these species have been recorded from the San Diego region of the Californian coast, namely *U. incisa*, *bispinosa*, *major* and *plumosa*, and of these the first three also occur in the Indian Ocean, while *intermedia* is known, at present, only from the Malay Archipelago; three species, *incisa*, *major* and *plumosa*, are known from the Atlantic Ocean, in which *minor* extends as far north as lat. 61° 30′ N.

In the present collection only two species are represented, namely *U. bispinosa* Esterly and *U. major* Giesbrecht.

Undeuchæta bispinosa Esterly.

Undeuchæta bispinosa, Esterly, 1911, p. 318, pl. xxvi, fig. 4, pl. xxix, figs. 48, 56; Sewell, 1929, p. 124, figs. 47 *a–e* and 48 *a–d*.

OCCURRENCE:

Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female, adult, 1 male, adult, and 3 juv.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 8 females, adult.
Sta. 145 C, Maldive area, 50–0 m., 2 juv.; 500–0 m., 10 females, adult.
Sta. 145 D, Maldive area, 300–0 m., 3 females, adult, 2 males, juv.; 500–0 m., 8 females, adult, 1 juv.
Sta. 172, Central part of Arabian Sea, 400–0 m., 19 females and 1 male; 850–0 m. 56 females, adult, and 1 male.
Sta. 186, Gulf of Aden, 600–0 m., 6 females.

DISTRIBUTION.—In the Indo-Pacific region; from the San Diego region of the Californian coast (Esterly), the Bay of Bengal and Laccadive Sea (Sewell), and the Maldive region, central and southern areas of the Arabian Sea and the Gulf of Aden (present records).

The vertical distribution would appear to range from about 300 metres down to at least 1000 metres, with a maximum at about 500 metres. Young stages may occur much nearer the surface at 50 metres depth.

Undeuchæta major Giesbrecht.

Undeuchæta major, Giesbrecht, 1892, p. 228, pl. xxxvii, figs. 56, 57, 59 ; van Breemen, 1908, p. 43, fig. 49 ; Wilson, 1932, p. 60, fig. 39, *a–d* ; Sars, 1925, p. 81, pl. xxiii, figs. 7–12.
Chirundina angulata, Sars, 1905*a*, p. 13 ; 1907, p. 3.

Occurrence.—Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female.

Distribution.—This species has been taken in the Pacific Ocean off the Californian Coast in the San Diego region (Esterly), in the North Pacific region (Giesbrecht), and in the Malay Archipelago (A. Scott). In the Indian Ocean it has been taken in the Indian Ocean and Bay of Bengal (Thompson), the Arabian Sea (Thompson and A. Scott, present record), the Gulf of Suez (Thompson), and the Agulhas current (Cleve). In the Atlantic Ocean it occurs in the South Atlantic and the adjacent part of the Indian Ocean (Wolfenden), the North Atlantic (Sars, Lysholm and Nordgaard), the west coast of Ireland (Farran), in the Gulf of Maine (Bigelow) and the Woods Hole region (Wilson), and in the area to the south of Iceland, the Iceland–Faroe Channel, and in Denmark Strait (With).

As regards the depth distribution, this species has been taken on the surface in both the Atlantic and Indian Oceans ; its main centre of occurrence is, however, to be found between 550 and 2000 metres.

Genus *Pseudeuchæta* Sars.

Pseudeuchæta, Sars, 1905*a*, p. 19 ; Sars, 1925, p. 102.
Autanepsius, Wolfenden, 1911, p. 350.

The genus *Pseudeuchæta* was created by Sars to accommodate a new species that he discovered in the North Atlantic, *P. brevicauda*, and he considered that the genus was closely related to *Euchæta*, and therefore placed it in the Family Euchætidæ. Farran (1906, p. 31) has, however, concluded that the genus " is in reality closely allied to *Bradyidius*, *Bradyetes* and *Bryaxis*," and therefore he has removed the genus from Euchætidæ and placed it in Ætideidæ. Wolfenden in 1911 described a genus *Autanepsius* to accommodate two species, namely *A. major* and *minor*, that were taken by the " Gauss " in the tropical part of the Atlantic Ocean. He is of the opinion that this genus should be placed in the family Augaptilidæ near *Augaptilus* and *Pontoptilus*.

In the present collection I have found a single adult female and a young male in Stage V, which agree so closely with Sars' *Pseudeuchæta brevicauda* and Wolfenden's *Autanepsius minor* that I am unable to discover any valid difference between them, and I am convinced that these two species are identical, Sars' name having priority ; Wolfenden's genus *Autanepsius* must be regarded as a synonym of *Pseudeuchæta*. A comparison of the characters of this species with those of the genera named by Farran has convinced me that he is right, and that the genus *Pseudeuchæta* must be placed in the Family Ætideidæ near *Bradyetes* and *Bryaxis*. In the following Table I have given the corresponding characters in these genera :

Bradyetes Farran.	*Pseudeuchæta* Sars.	*Bryaxis* Boeck.
Cephalon and 1st thoracic segment imperfectly separated.	ditto.	Cephalon and 1st thoracic segment fused.
Cephalon deeply inflexed in lateral margin.	ditto.	ditto.
Rostrum absent.	Rostrum absent or greatly reduced.	Rostrum absent.
Thoracic segments IV and V coalesced.	Thoracic segments IV and V incompletely fused.	Thoracic segments IV and V fused.
Posterior thoracic margin rounded.	Posterior thoracic margin rounded or produced in small blunt points.	Posterior thoracic margin pointed.
Abdomen (♀) of four segments: furcal rami slightly longer than broad.	Abdomen (♀) of four segments: furcal rami comparatively short.	Abdomen (♀) of four segments: furcal rami short.
Accessory furcal seta small.	ditto.	ditto.
1st antenna of 24 segments: strong, ringed setæ on joints 1, 2, 7, 13, 17, 20, 21, 22, 23 and 24.*	1st antenna of 24 segments: strong, ringed setæ on joints 3, 7, 8, 13, 15, 17, 20, 22, 23 and 24.*	1st antenna of 24 segments: all segments with strong ciliated setæ.
2nd antenna with exopod longer than endopod; exopod of 7 segments, segments 1 and 2 with papillæ bearing small setæ.	2nd antenna with exopod and endopod nearly equal; exopod of 7 segments, segments 1 and 2 with papillæ bearing small setæ.	2nd antenna with exopod poorly developed: exopod of 6 segments.
Mandible with endopod smaller than exopod.	ditto.	Mandible with endopod much smaller than exopod.
1st maxilla with very small exopodite.	ditto.	ditto.
2nd maxilla ?	Lobes 1–4 fringed with spinules: lobe 5 longer than others; setæ on lobe 5 not much thicker than the rest.	Lobes 1–4 with terminal group of spinules: lobe 5 longer than others, one seta on lobe 5 much thickened.
Maxilliped not markedly elongate; last 5 joints very short.	Maxilliped markedly elongate; last 5 joints very short; sausage-shaped sensory organ at end of 1st basal.	Maxillipeds largely developed; sausage-shaped sensory organ at end of 1st basal.
1st leg: exopod of 3 joints, endopod of 1 joint; exopod 1 with 1 inner seta and a marginal spine.	1st leg: exopod of 3 joints, endopod of 1 joint; exopod 1 without a marginal spine.	1st leg: exopod of 3 joints, endopod of 1 joint; exopod 1 with 1 inner seta and a marginal spine.
2nd leg: exopod of 3 segments, endopod of 2 segments; marginal spine of exopod 2 long.	ditto.	ditto.
3rd and 4th legs both with exopod of 3 joints and endopod of 3 joints.	ditto.	ditto.
5th leg absent.	5th leg greatly reduced or absent.	5th leg absent.

* These numbers correspond to the free joints and not to the segments, segments 8 and 9 being fused in all three genera.

In *Bradyetes* and *Bryaxis* the spines arising from the endopod of the maxilliped are normal, whereas in *Pseudeuchæta* these spines are armed with numerous small crescent, or half-moon shaped, lamellæ set transversely along the length of the seta. Sars makes no mention of these lamellæ in his account, and merely figures the setæ as being strongly denticulated, but Wolfenden, in his account of *Autanepsius*, calls attention to them and accurately figures them in *A. minor*. They are very difficult to see in mounted specimens owing to their refraction.

There can thus be but little doubt of the very close relationship between these three genera; indeed, so close is the resemblance between *Bradyetes* and *Pseudeuchœta* that they might almost be combined into one.

Pseudeuchœta brevicauda Sars. (Text-fig. 22, A–J.)

Pseudeuchœta brevicauda, Sars, 1905, p. 18; Sars, 1925, p. 102, pl. xxix, figs. 1–12.
Autanepsius minor, Wolfenden, 1911, p. 252, text-fig. 80 *a*, *b*, pl. xxxviii, figs. 9, 10.

Occurrence.—Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 female, 1 male, juv.

Descriptive Notes.—♀. Total length, 4·80 mm. This is the same length as Wolfenden's example, and somewhat smaller than Sars' specimen from the North Atlantic. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
402	118	94	67	57	27	94	47	37	27	30 = 1000

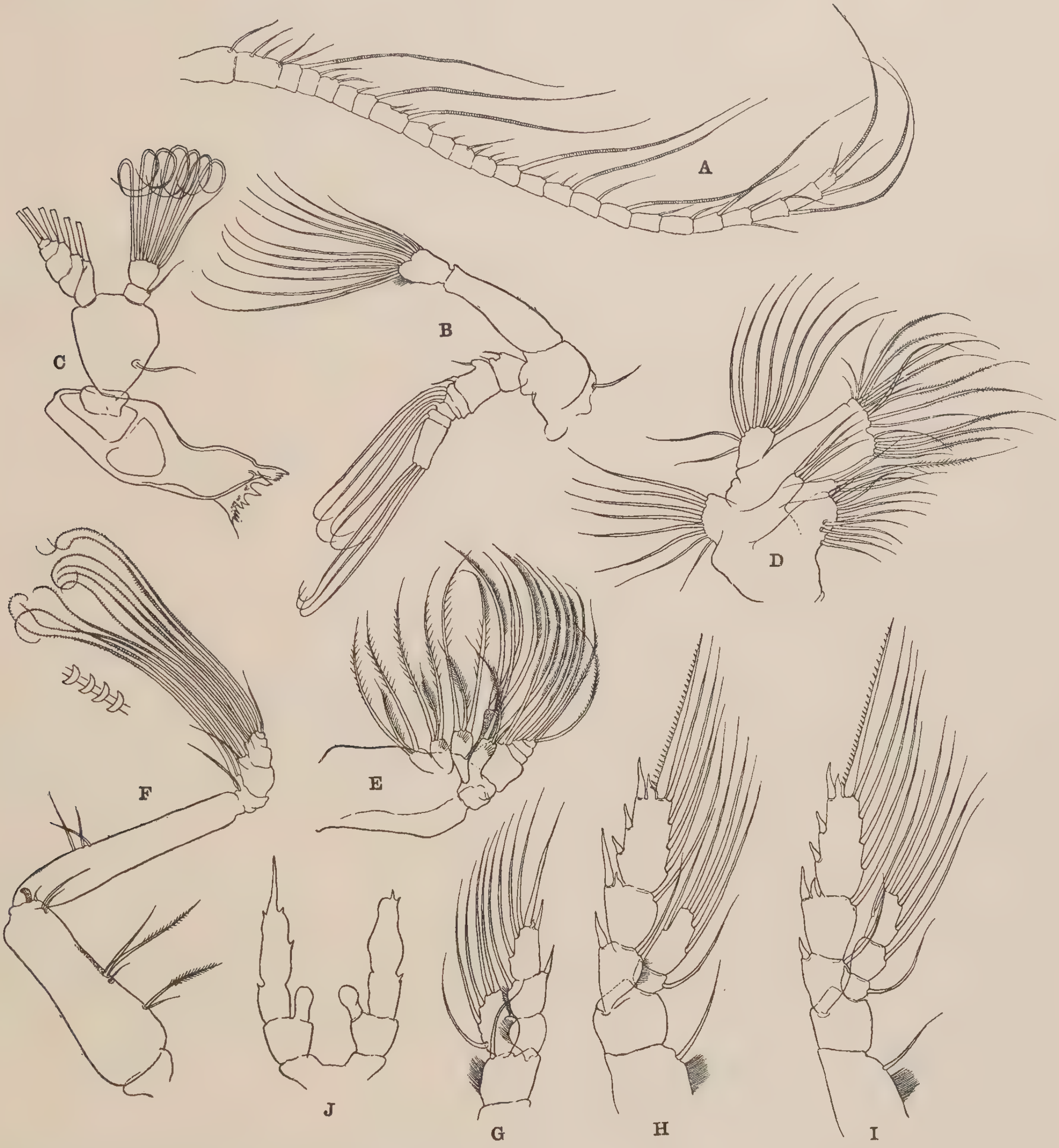
The cephalon tapers towards the anterior end and there is no trace of any rostrum; the lateral margin is markedly inflexed as in *Bradyetes*. The line of fusion of the cephalon and the 1st thoracic segment is clearly visible in the dorsal region. The 4th and 5th thoracic segments are only partially fused, the line of fusion being clear. The posterior thoracic margin is produced backwards in a small flap that is slightly prominent at its extreme apex, as figured by Wolfenden (1911, pl. xxxviii, fig. 9). The genital segment is somewhat expanded, and the genital orifice is situated on a slight swelling that is divided transversely by a groove: in length the segment is nearly equal to the following three segments together.

The 1st antenna (Text-fig. 22, A) reaches back to about the end of the cephalothorax: segments 8 and 9 are fused, but 24 and 25 are separate. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	70	70	33	29	31	29	29	52	31	31	31	43	43	43	43	43	43	43	40	43	45	57	48	29 = 1000

The 1st and 2nd segments are of equal length, and are considerably longer than any of the following segments. Segments 3, 7, 9, 14, 16, 18, 21, 23, 24 and 25 all bear long ringed setæ, as in *Bradyetes inermis* Farran. These numbers do not apparently tally with those given by Wolfenden or Farran, but these authors count the fused 8th and 9th segments as one, so that from the 9th segment on to the tip the above numbers are one more than theirs. The 23rd segment is considerably longer than the segment before or beyond it.

In the 2nd antenna (Text-fig. 22, B) the two branches are of approximately equal length. The outer ramus is composed of 7 segments; of these the 1st is produced on its anterior margin in two small prominences, from each of which arises a small seta, and the 2nd segment also carries one such projection near the proximal end, thus being very similar to the condition seen in *Bradyetes inermis* Farran.



TEXT-FIG. 22.—*Pseudochirella brevicauda* Sars, ♀. A, 1st antenna. B, 2nd antenna. C, Mandible. D, 1st maxilla. E, 2nd Maxilla. F, maxilliped. G, 1st leg. H, 2nd leg. I, 3rd leg. J, 5th pair of legs. ♂ Stage V.

In the mandible (Text-fig. 22, C) the biting ramus is provided with very strong teeth; the 2nd basal segment bears a single seta. The rami are of very unequal length, the exopod being much longer than the endopod. In the latter the 2nd segment bears 8 setæ and the 1st only one.

In the 1st maxilla (Text-fig. 22, D) the various lobes bear the following numbers of setæ :

The 1st inner lobe	13
,, 2nd ,, ,,	4
,, 3rd ,, ,,	3
,, 2nd basal	5
,, 1st segment endopod	4
,, 2nd ,, ,,	4
,, 3rd ,, ,,	6
,, exopod	10
,, outer lobe	8

This agrees with the numbers given by Wolfenden in *Autanepsius minor*. The longer setæ arising from the endopod are finely denticulated, as was pointed out by Sars, and so also are the longer setæ on Basal 2. The exopod is small, as in *Bradyetes*.

In the 2nd maxilla (Text-fig. 22, E) the 5th lobe is considerably longer than the others ; the 2nd, 3rd and 4th lobes are fringed with fine spines. Each lobe bears 3 setæ ; according to Wolfenden the 5th lobe bears only 2 setæ in *Autanepsius minor*.

In the maxilliped (Text-fig. 22, F) the proportional lengths of the various parts are as follows :

1st basal segment	41
2nd ,, ,,	44
Endopod	15

Wolfenden's measurements in *Autanepsius minor* are given as 22, 22 and 9, which correspond to 41·5, 41·5 and 17 : there is thus a very close agreement. The setæ arising from the segments of the endopod are armed with a number of closely-placed, crescentic plates, exactly as figured by Wolfenden (1911, text-fig. 80 *a*). These setæ are long, and taper to a delicate point. The 2nd basal segment bears at its distal end a blunt, sausage-shaped sensory organ, similar to that in *Bryaxis*.

The swimming legs (Text-fig. 22, G, H, I) agree exactly with the description and figures given by Sars.

Both Sars and Wolfenden state that the 5th pair of legs is absent. In the present specimen there is a very small rudimentary pair of 5th legs, composed of a basal plate and, on each side, a small ramus, composed of two very small, almost globular segments, that are entirely devoid of setæ.

Accompanying this female was a single immature male.

♂. *Stage V*. Total length, 3·89 mm.

The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
400	120	86	86	47	21	43	64	47	43	43 = 1000

The forehead resembles that of the adult female and is devoid of a rostrum. The posterior thoracic margin is produced back in a small flap that terminates in a bluntly pointed apex, below which there is a small notch in the margin.

The cephalic appendage and the first four pairs of legs resemble those of the female.

A rudimentary 5th pair of legs (Text-fig. 22, J) is present, and each consists of a two-jointed basal part and a single-jointed endopod and exopod. The former is indented in about the first third of its length, clearly denoting where the segmentation into two segments will be formed at the next moult; on the outer margin at this indentation there is a small spine. In the left leg the exopod terminates in a long, well-developed spine that is more than half the length of the segment; the outer border bears a small spine distally and two small spines on the inner border. In the right leg the exopod bears a small spine distally and a minute one at the distal outer angle. Both the endopods are short and have rounded extremities. At this stage the limb closely resembles that of an immature *Gœtanus* (*vide* With, 1915, text-fig. 27*e*, in *Gœtanus latifrons*) and *Euchirella* (*vide* With, 1915, text-fig. 33 *h*, in *Euchirella maxima*).

DISTRIBUTION.—The North Atlantic to the south of Davis Strait (Jespersen), off the Irish coast (Farran) and at several stations in the eastern region (Sars). As *Autanepsius minor*, it has been recorded from the Equatorial region of the Atlantic by Wolfenden. The present record extends its distribution to the Arabian Sea.

Genus *Valdiviella* Steuer.

Valdiviella, Steur, 1904, p. 593; Sewell, 1929, p. 133.

There has been in the past some divergence of opinion regarding the correct systematic position of this genus. Steuer, who created the genus, suggested that it ought to be included in the family Ætideidæ, but Sars (1905) and Wolfenden (1911) consideerd the genus to be closely related to Euchæta, and place it in the Euchætidæ. A. Scott (1909) agreed with this view, and in a previous paper (Sewell, 1929) I followed Scott and included the genus in the Euchætidæ. With (1915), however, agrees with Steuer, and remarks, "With some right Steuer suggests that it (the genus *Valdiviella*) ought to be referred to the Ætideidæ; the structure of the legs, of the labrum, the labium and the antennulæ support this view." Further evidence of the truth of this conclusion is to be found in the mouth parts, which much more nearly agree with those of some of the Ætideidæ than with the Euchætidæ. Thus the mandibular palp bears on the 2nd basal segment two setæ, of which the proximal is the longer, thus closely resembling the conditions found in *Pseudochirella* and most of the species of *Gœtanus*; 1st and 2nd maxillæ resemble those of the Ætideidæ. The 5th leg of the male also closely resembles, in its general type, the appendage in *Gœtanus* and *Chirundina*, and differs markedly from that of either *Euchœta* or *Paraeuchœta*. I am therefore of the opinion that *Valdiviella* must be included in the family Ætideidæ.

Valdiviella insignis Farran.

Valdiviella insignis, Farran, 1908, p. 45, pl. iii, figs. 1–6, pl. iv, fig. 5; Wolfenden, 1911, p. 247, pl. xl. figs. 6, 7; With, 1915, p. 154, text-fig. 44, *a–d*, pl. vi, fig. 2, *a–e*; Sars, 1925, p. 98, pl. xxvii, figs, 1–16, pl. xxviii, figs. 1–10; Sewell, 1929, p. 135, text-fig. 51.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 2091–0 m., 2 females.

REMARKS.—These examples agree closely with the description and figures given by previous workers. The total length was about 11·5 mm. As With (1915, p. 155) has pointed out, there appears to be some variation in the number of setæ that are carried by the outer lobe of the 1st maxilla; Farran states that in his examples from the west coast of Ireland there were 7, and Sars figures this number in his examples ; With, however, found only 6 in his specimen from the North Atlantic, and in the example from the Arabian Sea dissected by me there are only 5.

Distribution.—This species has now been taken in the North Atlantic as far north as lat. 61° 30′ N. (With), off the coast of Ireland (Farran), in the temperate region (Lysholm and Nordgaard), and between the Azores and Canary Islands and Gibraltar (Sars) ; in the tropical part of the South Atlantic (Wolfenden) ; and in the Arabian Sea (present record) and the Bay of Bengal (Sewell).

Valdiviella oligarthra Steuer.

Valdiviella oligarthra, Steuer, 1904, p. 593, figs. 1–3 ; Sewell, 1929, p. 140, text-fig. 54, *a*, *b*.

Occurrence.—Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 female.

Remarks.—The total length of this example was almost exactly 10·0 mm., which is slightly larger than Steuer's original example, which measured 9·0 mm., and considerably larger than the examples previously taken in Indian waters, which measured only 7·2 mm.

In this species, as in *V. insignis* Farran, there is a tendency for the number of setæ arising from the outer lobe of the 1st maxilla to vary ; Steuer states that the number is 7, but that in some specimens the 1st and 2nd may be wanting. In the present example all 7 were present.

Distribution.—Off the west coast of Africa (Steuer), in the tropical and northern Atlantic Ocean (Wolfenden), in the Arabian Sea, northern area (present record), near the Seychelles (Steuer), and in the Laccadive Sea and Bay of Bengal (Sewell).

Family Euchætidæ.

Genus *Euchæta* Philippi.

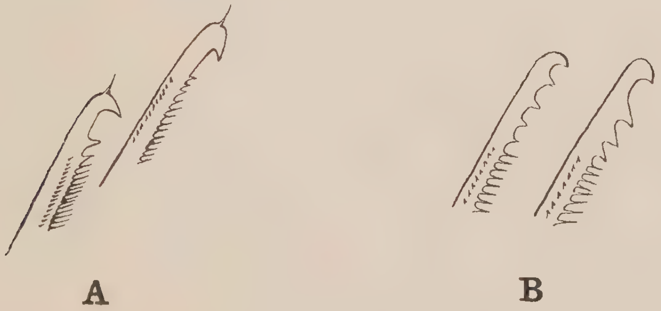
A number of species originally attributed to this genus have since been separated off by A. Scott (1909, pp. 64 and 69) in a new genus that he named *Paraeuchæta*. In the female in the genus *Euchæta* some of the six spines that spring from the terminal or endopod portion of the 2nd maxilla (or 1st maxilliped, as A. Scott terms it) are provided with long spinules, whereas in *Paraeuchæta* none of the spines are armed with these long spinules : in the male the 3rd segment of the exopod of the left 5th leg is produced in a long spiniform process in *Euchæta*, whereas in *Paraeuchæta* this 3rd joint is short and rudimentary. Sars (1925, p. 104) has followed A. Scott in separating these two genera, and he has added a further distinguishing character, namely the form of the accessory setæ of the furcal rami : in *Euchæta* these accessory setæ are much more strongly developed than the other furcal setæ, whereas in *Paraeuchæta* they are always very slender and are of a different shape, arising from a small conical prominence at the inner distal angle of the ramus and exhibiting a well-marked " knee-joint " not far from the base.

A further point of difference is to be found in the character of the distal end of the long spines arising from the endopod of the maxilliped : in those species that have been referred to the genus *Euchæta* each spine terminated in a minute bifurcation, one branch of which forms a recurved tooth, while the other forms a delicate, tapering, short flagellum. This type (Text-fig. 23, A) has been recognized in the following:

Euchæta consimilis Farran.
E. marina (Prestand.).
E. media Giesbr.
E. spinosa Giesbr.
E. tenuis Esterly.
E. wolfendeni A. Scott.

In the case of the females of those species that have been referred to the genus *Paraeuchæta*, these spines terminate in a rounded end without any flagellum, and the distal part of the inner margin is armed with a row of three or four comparatively stout teeth, forming a comb (Text-fig. 23, B). This character has been seen in—

Paraeuchæta investigatoris Sewell.
P. malayensis Sewell.
P. weberi A. Scott.



TEXT-FIG. 23.—The tips of the terminal spines of the maxilliped in A, *Euchæta* and B, *Paraenchæta.*

With (1915, p. 157) is, however, doubtful whether the distinction between these two groups of species is really a valid one, and he points out that in *Euchæta hebes* Giesbrecht, in which the 5th leg of the male conforms to the type of Scott's genus *Paraeuchæta*, one of the apical setæ of the 2nd maxilla is armed with long spinules, as in the genus *Euchæta* (*sensu stricto*). He also points out that in *Euchæta acuta* Giesbrecht also only a single such spine is present. It thus appears that *Euchæta hebes* Giesbrecht forms a connecting link between the two groups *Euchæta* and *Paraeuchæta*, but this seems to me to be hardly sufficient grounds for refusing to recognize the two genera.

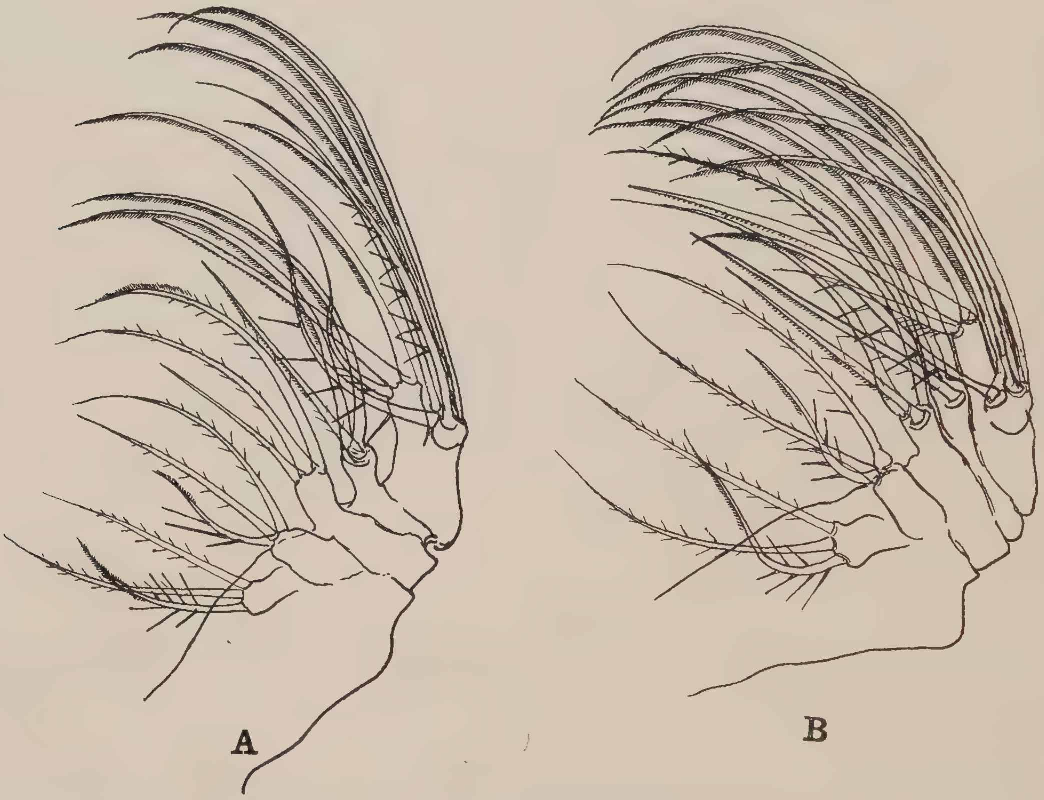
A careful examination of those species in the present collection that can be referred to this genus has revealed that they can be subdivided into two groups, according to whether the terminal part of the 2nd maxilla bears only one spine that is provided with long lateral spinules, or two such spines.

In Group I, of which *Euchæta marina* (Prestand.) may be taken as the type, two of the apical spines are armed with long spinules (Text-fig. 24, A). To this Group may be referred *Euchæta marina* (Prestand.) and *Euchæta wolfendeni* A. Scott.

In Group II only a single spine arising from the endopod of the 2nd maxilla is furnished with lateral spinules (Text-fig. 24, B), and in this Group must be included the following :

Euchæta acuta Giesbrecht.
E. concinna Giesbrecht.
E. consimilis Farran.
Euchæta media Giesbrecht.
E. spinosa Giesbrecht.
E. tenuis Esterly.
Euchæta murrayi sp. nov.

Euchæta hebes Giesbrecht forms a connecting link between this Group and the genus *Paraeuchæta* A. Scott.



TEXT-FIG. 24.—The 2nd maxilla in *Euchæta*. A, In species belonging to Group I. B, In species belonging to Group II.

GROUP I.—Both species of this group, *Euchæta marina* and *E. indica* Wolfenden, were present in the collection that Wolfenden examined from the Maldive and Laccadive Archipelagos : unfortunately in his account of *E. indica* Wolfenden, as A. Scott (1909, p. 67) has pointed out, gave a wrong description of the 2nd leg, the account being apparently taken from the corresponding appendage of *E. marina*. He further complicated matters by incorrectly naming the figures which illustrated his account ; thus in pl. C, figs. 12–16, which are labelled *Euchæta indica*, are clearly drawn from *E. marina*, while figs. 7, 8, 10, 11, 17 and 18, labelled *Euchæta marina* ♀, actually refer to *E. indica*. A comparison of Wolfenden's figures and those given by A. Scott in his account of *E. wolfendeni* leaves no doubt that the two forms are identical, but to avoid further confusion I have adhered to the name given by A. Scott.

GROUP I.

Euchæta marina (Prestandrea). (Text-fig. 25, A–D.)

Euchæta marina, Giesbrecht, 1892, p. 246, pl. i, figs. 10–11, pl. xv, figs. 31, 33, pl. xvi, figs. 15–17, 22, 23, 25, 29, 30, 41, 46, pl. xxxvii, figs. 30, 37, 38, 49; A. Scott, 1909, p. 67, pl. xix, figs. 9–20.
Euchæta marina, Wolfenden, 1906, p. 1008, pl. c, figs. 19, 20.
Euchæta indica, Wolfenden, 1906, pl. c, figs. 12–16.

OCCURRENCE:

Sta. 61 A, Northern part of Arabian Sea, surface, 1000–0 m., 18 females; 1500–0 m., 38 females, 3 males; 2000–0 m., 1 female, 2 males.
Sta. 61 C, Northern part of Arabian Sea, surface, 1205 examples; 1000–0 m., 104 females, 12 males; 1500–0 m., 40 females, 2 males.
Sta. 76, Gulf of Oman, 200–0 m., 4 females; 600–0 m., 1 female.
Sta. 96, Central part of Arabian Sea, 10 m., 6 females, 1 male; 645–400 m., 78 females, 3 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 76 females, 2 males; 1500–0 m. vertical, 36 females, 7 males.
Sta. 145 C, Maldive area, 50–0 m. vertical, 7 females, 1 male; 300–0 m. vertical, 7 females; 500–0 m. vertical, 4 females, 1 male.
Sta. 145 D, Maldive area, 50–0 m. vertical, 3 females; 100–0 m. vertical, 3 females; 300–0 m. vertical, 1 female, 1 male.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

REMARKS.—This species appears to exhibit a considerable range of variation in size: Brady (1883, p. 60, under the name *E. prestandreæ*) gives the range as 3–5 mm.; Giesbrecht (1892, p. 249) gives the range as 2·25 to 3·9 mm., and these dimensions are subsequently given by Giesbrecht and Schmeil (1898) and by van Breemen (1908). Wolfenden (1906, p. 1007) gives the length as 3·3 mm., and Wilson (1932, p. 64) gives the range as 2·25 to 4 mm. The present specimens, taken together at Sta. 61 in the northern area of the Arabian Sea, show a range from 3·0 mm. to 3·683 mm., the mean being 3·40 mm.

Although these specimens do not fall into groups, such as one would expect if there were more than one race or form present, there are, nevertheless, certain structural differences between the larger and smaller examples that appear worthy of notice.

The proportional lengths of the various segments of the body are as follows:

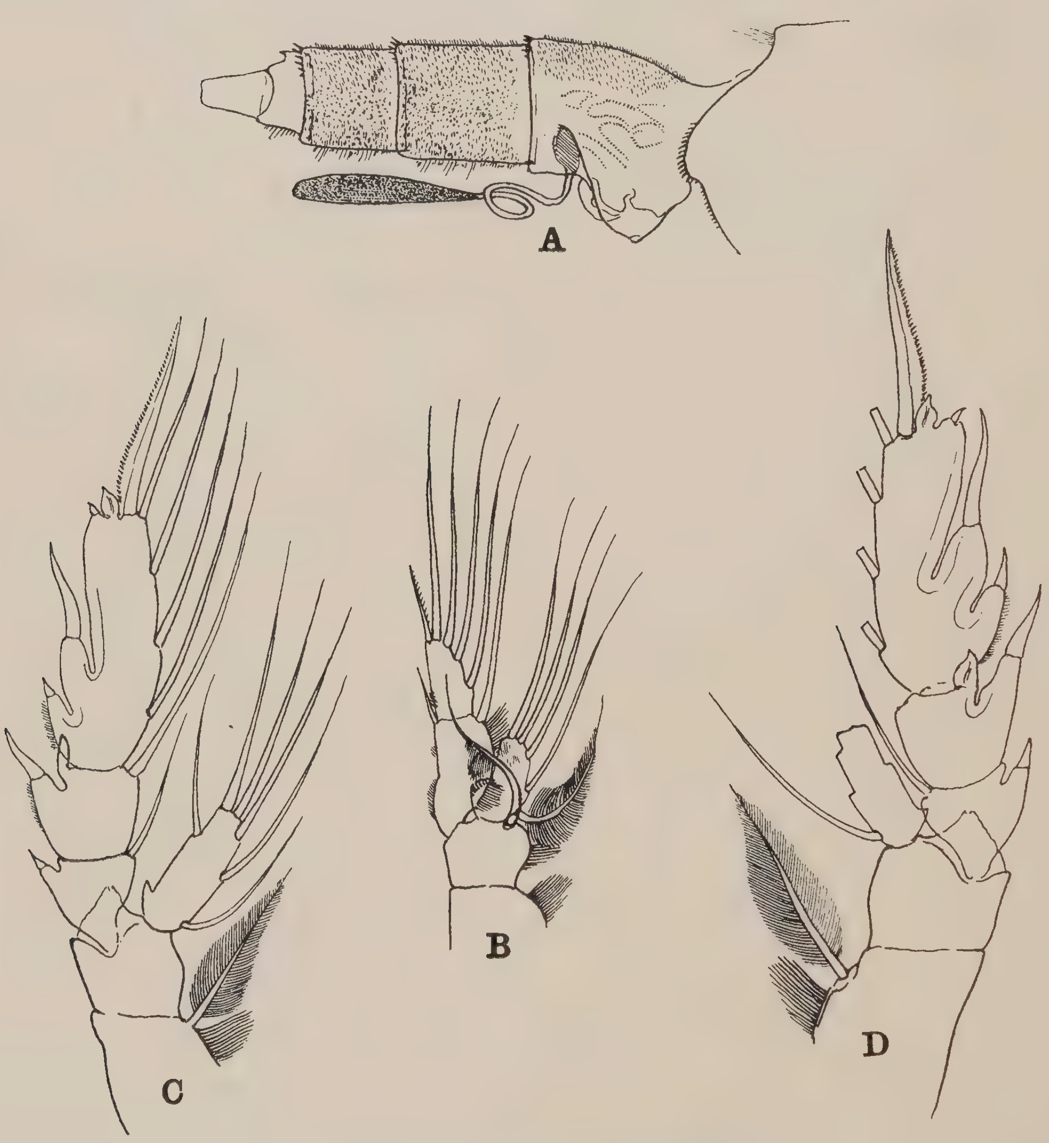
	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
Small example, 3·0 mm.	319	115	84	84	89	120	68	53	26	42 = 1000
Large example, 3·683 mm.	307	118	90	77	95	127	68	50	27	41 = 1000

We thus have a slight reduction in the proportional length of the cephalothorax in the larger specimens, as compared with the smaller examples, and a slight change in the proportional lengths of the cephalothorax and abdomen, namely from 691 and 309 in the small, to 687 and 313 in the large—differences that agree closely with the change in the proportional lengths of the parts of the body in successive moults in a single species (*vide* Sewell, 1929).

There are also slight differences in the proportional lengths of the segments of the 1st antenna, as shown below :

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.
Small specimen	58	36	16	16	21	22	24	34	20	22	30	38	40	43	54	54
Large specimen	62	38	17	17	21	22	25	36	21	22	32	38	41	46	56	54

Segment	18.	19.	20.	21.	22.	23.	24–25.
Small specimen	57	70	67	62	70	64	80 = 1000
Large specimen	56	70	69	62	65	58	72 = 1000



Text-fig. 25.—*Euchæta marina* (Prestandrea), ♀. A, Abdomen, lateral view. B, 1st leg. C, 2nd leg in small form. D, 2nd leg in large form.

As in the different growth stages of a species, so here there appears to be evidence that in the larger form the segments of the proximal part of the appendage are larger than in the smaller form up to about the 17th–19th segments, and beyond this the distal segments become progressively smaller, the percentage decrease in the terminal three joints being 7·1, 9·4 and 10·0 per cent.

Differences can also be detected in the relative length of the 2nd spine on the external margin of the 3rd segment of the exopod of the 2nd foot (Text-fig. 25, C, D). In some specimens this spine reaches as far as the tip of the 3rd marginal spine, whereas in others it falls considerably short of the base of the 3rd spine, and this difference, too, appears to be associated with the size of the individual, for in specimens having an average total length of 3·50 mm. it reached the tip of the 3rd marginal spine, in specimens having an average length of 3·40 mm. it reached to the base of the 3rd spine, and in specimens having a length of 3·10 mm. it fell short of the base.

In one specimen the joint between the 1st and 2nd segments of the exopod of the 2nd leg was incomplete, and the part of the combined segment that represented segment 1 was devoid of an inner seta.

At Sta. 61, in the northern area of the Arabian Sea, in the month of November, the breeding season appeared to be in full swing. Many of the females were carrying egg-sacs, and the number of ova ranged from 7 to 15, with a mean of 11. In every case the ovigerous female was also bearing one or more spermatophores: the maximum number of these latter observed on any single female was 11. A few males were also found bearing a spermatophore in the clasping apparatus of the left 5th leg.

One example of a young male in the 5th Copepodid Stage was seen to be infected with a *Blastodinium*, probably *B. contortum* Chatton (*vide* Chatton, 1920, p. 175).

DISTRIBUTION.—West coast of America between 26° S. to 20° N. (Giesbrecht), Pacific Ocean between 42° N. and 40° S. (Brady, as *E. prestandreæ*), the Aru Archipelago (Früchtl), the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean from the coast of Southern Burma (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Laccadive Sea (Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden and present records), the Arabian Sea (Thompson and A. Scott, present records), the Gulf of Oman (present record), the Persian Gulf (Pesta), the Red Sea and Gulf of Suez (Thompson and A. Scott, A. Scott), Durban Bay (Brady), the Agulhas Current (Cleve), and west of the Crozet Islands (Brady, as *E. prestandreæ*). In the Atlantic Ocean, west of Cape Colony (Cleve), in the South Atlantic (Wolfenden, Farran, T. Scott) to 35° S., in the Tropical Atlantic (Dana, T. Scott, Farran), Gulf of Guinea (T. Scott), North Atlantic (Cleve, T. Scott, van Breemen, Sars, Rose), Mediterranean Sea (Philippi, Giesbrecht, Thompson, Thompson and A. Scott), in the Adriatic Sea (Pesta), the Gulf of Maine (Bigelow), and in the Woods Hole region (Wilson).

Euchæta wolfendeni A. Scott.

Euchæta indica (♀), Wolfenden, 1906, p. 1007.
Euchæta marina, Wolfenden, 1906, pl. C, figs. 7, 8, 10, 11, 17 and 18.
Euchæta wolfendeni, A. Scott, 1909, p. 68, pl. xvii, figs. 1–12; Sewell, 1929, p. 153.

OCCURRENCE:

Sta. 61 A, Northern part of Arabian Sea, surface, 960 examples; 1000–0 m., 6 examples; 1500–0 m., 14 females; 2000–0 m., 8 females, 2 males.

Sta. 61 C, Northern part of Arabian Sea, surface, 7086 specimens; 1000–0 m., 63 females, 8 males; 1500–0 m., 9 females.

Sta. 76, Gulf of Oman, 200 m., 11 females; 600 m., 5 females; 1500 m., 4 females.

Sta. 96, Central part of Arabian Sea, 10 m., 11 females, 1 male; 635–390 m., 3 females.

Sta. 145 C, Maldive area, 50–0 m. vertical, 1 female.

Sta. 145 D, Maldive area, 50–0 m. vertical, 1 female.

REMARKS.—Several examples from Sta. 61 are infected with a species of *Blastodinium*, apparently *B. contortum* Chatton (*vide* Chatton, 1920, p. 175). In some instances infection had occurred as early as the 3rd Copepodid Stage. In two examples the infection was double and the parasites exhibited the "forme supertordue" of Chatton (cf. Chatton, *loc. cit.*, figs. 96 and 97).

DISTRIBUTION.—The Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), the Andaman Islands and Ganjam Coast of India (Sewell), the Ceylon Pearl Banks (Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden, present records) and the Arabian Sea (present records).

GROUP II.

Euchæta consimilis Farran.

Euchæta concinna (*non* Giesbrecht), Wolfenden, 1906, p. 1008, pl. c, figs. 1–6.
Euchæta consimilis, Farran, 1936, p. 90, fig. 6, *a* and *b*.

OCCURRENCE.—Sta. 61 C, Northern part of Arabian Sea, surface, 3 females.

DESCRIPTIVE NOTES.—Farran has separated this species from *E. concinna* Giesbrecht on the grounds of the somewhat different shape of the genital segment of the female abdomen and its very slightly smaller size. The present examples agree exactly with the description and figures given by Wolfenden (*loc. cit.*) of the examples that he took to represent *E. concinna* Giesbrecht and those specimens that I obtained from the Bay of Bengal and Nicobar Islands (*vide* Sewell, 1929, p. 148), in which the characteristic projection of the right side of the genital segment was more pronounced.

DISTRIBUTION.—The Australian Barrier Reefs (Farran), the Nicobar Islands and the Bay of Bengal (Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), and the Northern part of the Arabian Sea (present record).

Euchæta media Giesbrecht.

Euchæta media, Giesbrecht, 1892, p. 246, pl. xvi, figs. 13, 36, pl. xxxvii, figs. 39, 40; A. Scott, 1909, p. 66, pl. xx, figs. 10–18; Esterly, 1905, p. 160, fig. 25.

OCCURRENCE:

Sta. 131 D, South area of Arabian Sea, 500–0 m. vertical, 2 females; 1500–0 m. vertical, 1 female.

Sta. 172, Central part of Arabian Sea, 400–0 m., 5 females; 850–0 m., 1 female.

DISTRIBUTION.—The San Diego region of the Californian coast (Esterly), and the Pacific Ocean between long. 103° and 166° E. (Giesbrecht), off New Zealand and on the Australian Barrier Reefs (Farran), and in the Malay Archipelago (A. Scott). In the Indian Ocean it has been taken in the Nicobar Islands (Sewell) and in the Arabian Sea (present records).

Euchæta spinosa Giesbrecht.

Euchæta spinosa, Giesbrecht, 1892, pp. 246, 263, pl. xvi, figs. 12, 26, 34; pl. xxxvii, figs. 31, 34, 35 and 51; van Breemen, 1908, p. 52, fig. 58, *a*, *b*; Sars, 1925, p. 104, pl. xxx, figs. 1–6.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

REMARKS.—♀. Total length, 6·70 mm.

DISTRIBUTION.—In the Pacific Ocean this species has been taken in the San Diego Region of the Californian coast (Esterly). In the Indian Ocean it has been reported from the Nicobar Islands (Sewell), off Ceylon (Thompson and A. Scott), and to the South of Cape Colony (Cleve). In the Atlantic Ocean and its offshoots it has been taken in the South Atlantic (Cleve, Stebbing), the North Atlantic region (Cleve, van Breemen, Rose), off the Azores and Canary Islands (Sars), in the Bay of Biscay (Farran), off Cape Cod (Sharpe), and in the Woods Hole region (Wilson), in the Mediterranean (Giesbrecht, Thompson and A. Scott), and the Adriatic (Pesta). Usually it is of rare occurrence.

Euchæta tenuis Esterly.

Euchæta tenuis, Esterly, 1906, p. 61, pl. ix, fig. 13, pl. x, figs. 29, 30; A. Scott, 1909, p. 68, pl. xix, figs. 1–8; Sewell, 1929, p. 149, text-fig. 58 *a–j*.
Euchæta solida, Esterly, 1911 *b*, p. 342, pl. xxvi, fig. 2, pl. xxviii, fig. 34, pl. xxx, fig. 78 (♂).

OCCURRENCE:

Sta. 96, Central part of Arabian Sea, 645–400 m., 20 females.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 1 female; 1500–0 m. vertical, 4 females.
Sta. 145 C, Maldive Region, 500–0 m. vertical, 1 male.
Sta. 172, Central part of Arabian Sea, 200–0 m., 5 females, 2 males; 400–0 m., 56 females, 15 males; 850–0 m., 74 females, 5 males.
Sta. 186, Gulf of Aden, 575–0 m., 18 females, 3 males; 950–0 m., 26 females, 2 males.

DISTRIBUTION.—In the Pacific Ocean this species has been taken in the San Diego region of the Californian coast of America (Esterly), and in the Malay Archipelago (A. Scott). In the Indian Ocean it appears to be fairly widely distributed, having been taken in the Bay of Bengal (Sewell), the Maldive region, the Arabian Sea and the Gulf of Aden (present records).

Euchæta murrayi sp. nov. (Text-fig. 26, A–I.)

OCCURRENCE:

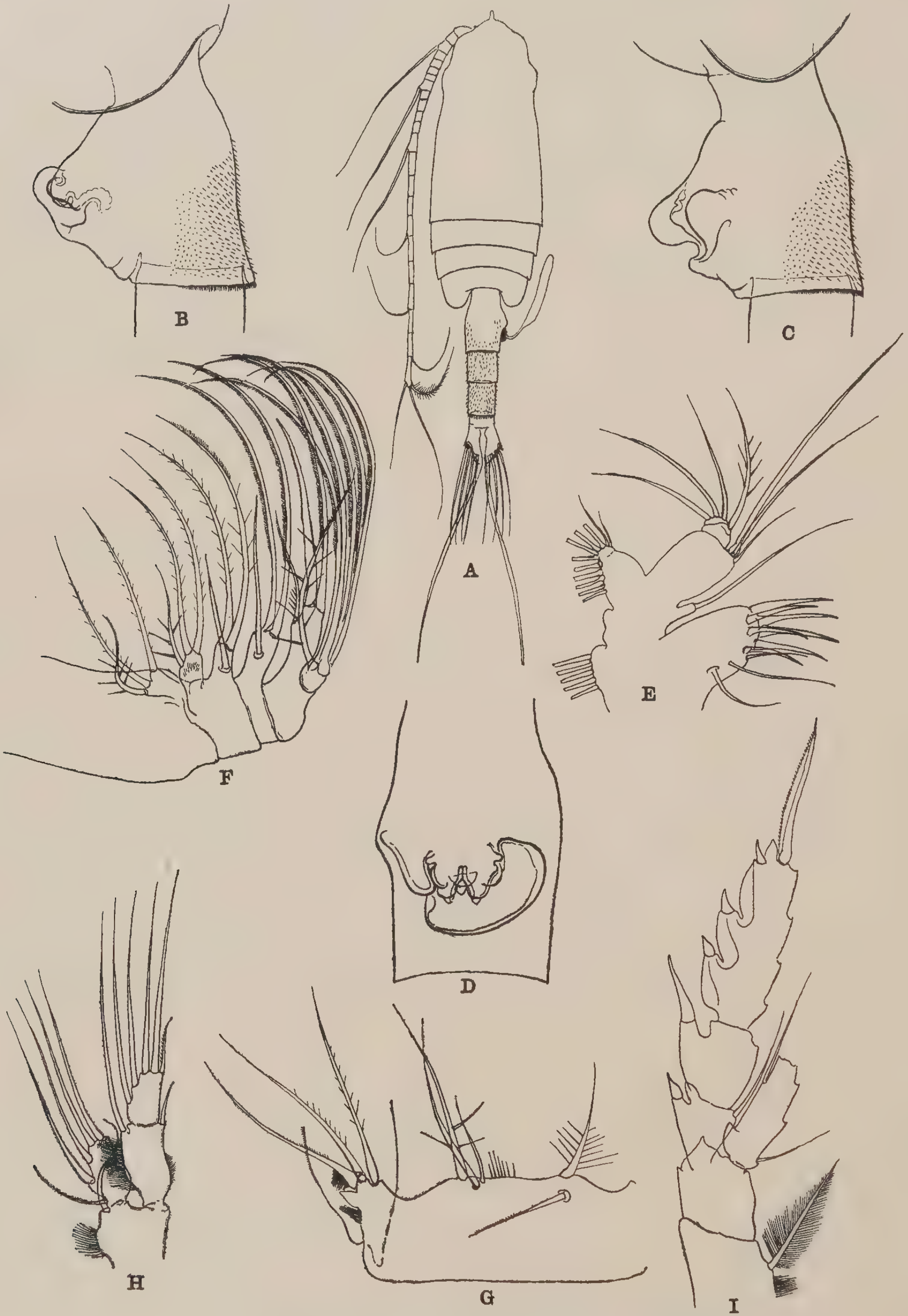
Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 female.
Sta. 61 C, Northern part of Arabian Sea, 1000–0 m., 5 females; 1500–0 m., 2 females.
Sta. 76, Gulf of Oman, 600–0 m., 1 female; 1500–0 m., 1 female.

DESCRIPTIVE NOTES.—♀. Total length, 2·58–2·78 mm.

The proportional lengths of the cephalothorax and abdomen are as 71 to 29. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
330	135	59	56	59	140	77	77	21	46 = 1000

The frontal eminence is prominent, as in *E. marina*, and the rostrum is well developed and points downwards and slightly forwards. The posterior thoracic margin is uniformly rounded.



Text-fig. 26.—*Euchæta murrayi* sp. nov. ♀. A, Dorsal view. B, Genital segment, lateral view. C, Genital segment, lateral view. D, Genital segment, ventral view. E, 1st maxilla. F, 2nd maxilla. G, Basal segment of maxilliped. H, 1st leg. I, 2nd leg.

The genital segment (Text-fig. 26, B, C) is rather sparsely covered with short hairs on the dorsal aspect, and the dorsal part of the posterior margin is fringed with a row of small spinules. The genital aperture is prominent ventrally and is situated in the posterior part of the segment; the aperture (Text-fig. 26, D) is bounded by, on the left side, a prominent rounded lamella, that commences at about the middle of the segment and is continued backwards and across the segment behind the vulva; on the right side is a smaller lappet. The 2nd and 3rd free segments of the abdomen are covered both dorsally and ventrally with numerous short hairs, and a few longer hairs arise from the ventral aspect of the 3rd segment. The furcal rami bear a number of short hairs on the ventral aspect. The accessory setæ are long, being about equal to the length of the whole body.

The 1st antenna reaches back to about the middle of the abdomen. It consists of the usual 23 free segments, that have the following proportional lengths:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	57	35	17	18	23	23	26	36	21	21	30	39	42	48	51	54	57	70

20.	21.	22.	23.	24–25.	
70	67	65	57	73	= 1000

The 8th and 9th segments are completely fused and the 12th and 13th partly so; the 24th and 25th segments are also fused. The 3rd, 7th, 9th, 14th, 18th, 21st, 23rd, 24th and 25th segments bear the usual long setæ.

In the 2nd antenna the 1st basal segment is provided with a row of hairs on the inner aspect. The two rami are of approximately equal length. The terminal segment of the endopod bears 6 and 7 setæ on the two lobes.

In the 1st maxilla (Text-fig. 26, E) the various lobes bear the following setæ:

Le. 1 . .	5 setæ, as in *E. marina* and *hebes*.
Li. 1 . .	10 setæ.
Li. 2 (or 3) .	1 seta.
B. 2 . .	1 long and 2 short setæ, as in *E. marina*, *acuta* and *spinosa*.
Ri. 1 . .	No seta.
Ri. 2–3 . .	1 + 3 setæ.

In the 2nd maxilla (Text-fig. 26, F) one of the spines, out of six, arising from the terminal lobe, presents the characteristic lateral spinules.

The maxilliped has the characteristic form of the genus. The spines arising from the endopod terminate in sharp points, without any trace of serrations. At the distal end of the 1st basal segment (Text-fig. 26, G) below the origin of the most distal spine is a short conical process, and below this is a tuft of hairs. The base of the seta immediately above this process is also hairy.

In the 1st leg (Text-fig. 26, H) the exopod is composed of two segments only, and the endopod of one. The outer border of the 1st segment of the exopod is slightly sinuate.

In the 2nd leg (Text-fig. 26, I) the exopod is composed of the usual three segments. The marginal spines on the 1st and 3rd segments are small and sub-equal, but that arising from the 2nd segment is greatly increased in size and extends as far as the base of the proximal spine on the 3rd segment; there is in this respect a close degree of similarity between this species, *E. concinna* Giesbrecht and *E. consimilis* Farran. The endopod is as usual composed of a single segment.

The 3rd and 4th legs are of the usual type.

Genus *Paraeuchæta* A. Scott.

Paraeuchæta, A. Scott, 1909, p. 69.
Pareuchæta, Sars, 1925, p. 111.

At the present time this genus includes some 35 species, of which three are known from the male only.

As Giesbrecht (1892, p. 260) has pointed out in his account of the genus *Euchæta* (*sensu lato*), the 1st maxilla is rich in specific criteria. Those species of *Paraeuchæta*, in which this appendage has been described, can be separated into several groups, according to the number of setæ that arise from the outer lobe:

Group I.—In the following species Le. 1 of the 1st maxilla of the female bears in all 9 setæ, of which 6 are stout and the 2 proximal and the distal are considerably smaller:

Paraeuchæta antarctica Giesbrecht.
P. austrina Giesbrecht.
P. exigua Wolfenden.
P. glacialis Hansen.
P. gracilis Sars (= *P. quadrata* Farran).
P. hanseni With.
P. malayensis Sewell (= *P. barbata* A. Scott).
P. norvegica Boeck.
P. similis Wolfenden.
P. weberi A. Scott.

Group II.—In the following species Le. 1 of the 1st maxilla of the female bears 7 setæ, of which the 2 proximal are usually small:

Paraeuchæta barbata Brady, Farran.
P. bradyi With.
P. californica Esterly.
P. farrani With (= *P. barbata* Sars).
P. scotti Farran.

Wolfenden (1911, p. 301) states that *Paraeuchæta scotti* possesses only 5 setæ on this lobe, but it is probable that he has overlooked the 2 small proximal setæ.

Group III.—In the following species Le. 1 of the 1st maxilla of the female bears 6 setæ:

Paraeuchæta bisinuata Sars.
P. investigatoris Sewell (= *P. californica* A. Scott, *non* Esterly).
P. robusta Wolfenden.

Group IV.—In the following species Le. 1 of the 1st maxilla of the female bears 5 setæ:

Paraeuchæta flava Giesbrecht.
P. hebes Giesbrecht.
P. rubicunda Farran.

GROUP I.

Paraeuchæta hanseni (With).

Euchæte hansenii, With, 1915, p. 181, text-figs. 52 *a*, *b*.
Pareuchæta hanseni, Sars, 1925, p. 115, pl. xxx, figs. 15–18.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 2091–0 m., 1 female.

REMARKS.—The total length of this specimen was 9·8 mm., which is slightly larger than either With's original example, which measured 8·9 mm., or Sars' examples, which were 9·4 mm. With (1915, p. 182) points out that this species is nearly related to *P. sarsi* (Farran), "but is easily distinguished by the smaller size, by the structure of the genital somite, by the 9 setæ in the Le. 1 of the maxillulæ, and by the well developed Se. Re. pes 1." As regards size, this does not hold good, for while With's specimens of *P. sarsi* measured 10 mm., Sars' specimens were only 8·7 mm., and those taken by the John Murray Expedition were still smaller, measuring only 8·47 mm., which is thus considerably smaller than examples of *P. hanseni*.

The present specimen showed the typical structure of the genital aperture.

OCCURRENCE.—Up to the present time this species has only been recorded off south-west Greenland (Jespersen), from the North Atlantic, lat. 60° N. (With), and near the Azores (Sars, Rose). The present record extends the distribution to the Arabian Sea.

It would appear to be a deep-water form, for Sars' examples were taken in hauls from 3000 and 3250 metres, and the present specimen in one from 2091 metres.

Paraeuchæta malayensis Sewell. (Text-fig. 27, A–F.)

Paraeuchæta barbata (*non Euchæta barbata* Brady), A. Scott, 1909, p. 79, pl. xviii, figs. 1–8.
Paraeuchæta malayensis, Sewell, 1929, p. 160, text-figs. 62, *a*–*j*.

OCCURRENCE :

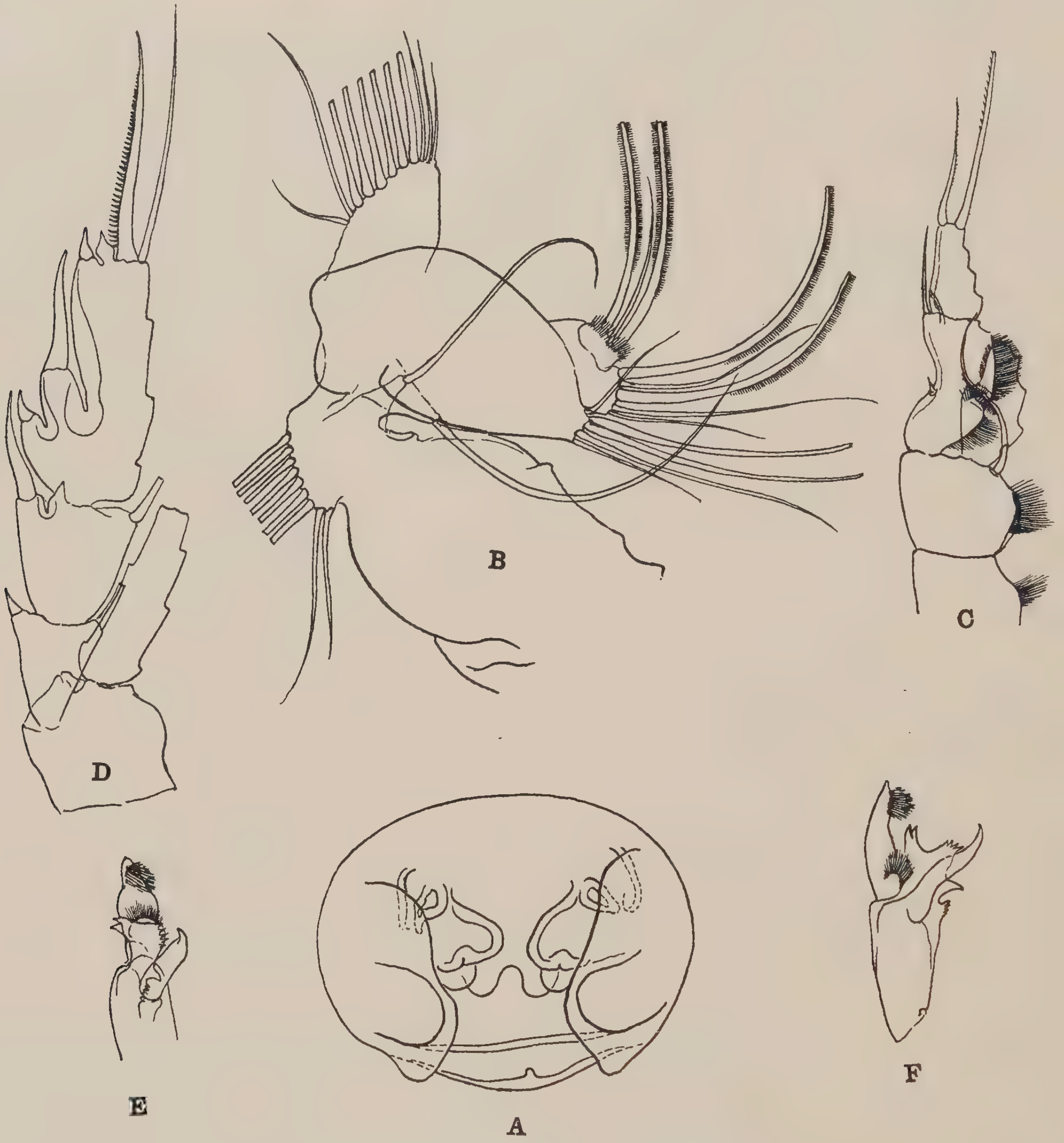
Sta. 131 D, Central part of Arabian Sea, 1500–0 m., 1 female.
Sta. 172, Central part of Arabian Sea, 850–0 m., 4 females, 1 male.

DESCRIPTIVE NOTES.—♀. Total length, 6·8–7·0 mm.

The proportional lengths of the cephalothorax and abdomen are as 68 to 32. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
283	146	88	93	70	128	74	65	7	46 = 1000

The rostrum is directed downwards, thus resembling the condition present in *Paraeuchæta barbata*. The posterior thoracic margin is rounded and is provided with a dense bunch of long hairs ; the postero-ventral region is slightly emarginate. In the stained specimen a narrow line of fusion can be seen between thoracic segments 4 and 5. The dorso-lateral spine on segment 5 is absent. The genital segment closely resembles that of *Paraeuchæta sarsi* Farran and allied species : on either side of the genital aperture (Text-fig. 27, A) there is a lobe that is rounded posteriorly. When viewed from the ventral aspect the genital aperture is seen to be oval in shape, and on each side is the ear-shaped swelling of the lateral lobe, between which lies a pair of smaller ear-shaped swellings ; in front of these latter are paired curved thickenings with the concavity posterior, and at the posterior end of the aperture are a pair of widely separated, curved thickenings, with the concavity directed inwards. On the left side in the ventro-lateral region and on a line with the posterior margin of the genital aperture is a low crescentic ridge of thickened chitin, that does not, however, form a definite papilla. The ventral aspect of the 3rd, 4th and 5th abdominal segments are furnished with long hairs, and the furcal rami are also hairy on the ventral and lateral aspects. On the dorsal part of the posterior margin of the 3rd abdominal segment is a group of two or three large spinules. The anal segment is very short and is telescoped into the 4th segment. The 1st, 3rd and 4th furcal setæ are of approximately equal length, but the 2nd seta is much longer, the proportional lengths being as 80 to 190 ; the accessory setæ measure 380.



Text-fig. 27.—*Paraeuchæta malayensis* Sewell. A, Genital aperture, ♀. B, 1st maxilla, ♀. C, 1st leg, ♀. D, 2nd leg, ♀. E, Clasping organ of left 5th leg, ♂. F, Another view of same.

The 1st antenna reaches back as far as the middle of the 2nd free (3rd) abdominal segment; in my previous account (Sewell, 1929, p. 161) I stated that it reached back to the posterior thoracic margin, but this appears to be incorrect. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	54	38	22	22	24	24	24	30	20	20	26	39	41	48	60	58	60	71

20.	21.	22.	23.	24–25.	
69	64	60	51	75	= 1000

The combined 24th and 25th segments are together longer than the 19th segment. The 2nd to 13th segments inclusive are provided on their posterior aspects with long hairs.

The 2nd antenna and mandible are of the usual type.

In the 1st maxilla (Text-fig. 27, B) the outer lobe bears 7 large setæ and posteriorly two other smaller ones, making 9 in all. The exopod bears 11 setæ. The inner lobe 1 bears 12 setæ; inner lobes 2 and 3 each bear a single stout seta. The 2nd basal segment bears 5 setæ, of which the inner- and outermost are very small. The 1st segment of the endopod bears 5 setæ, of which 2 are stout and are spined along one margin, and the combined 2nd and 3rd segments bear 3 setæ, of which the middle one is small and the 1st and 3rd are stout, and are spined along both margins. At the base of these setæ on endopod 2–3 is a group of fine hair-like spinules.

The 2nd maxilla and the maxilliped have the usual characters.

In the 1st leg (Text-fig. 27, C) the exopod is composed of the usual two free segments, segments 1 and 2 being fused, but the line of fusion is clearly seen on the inner part of the ramus. The outer border is markedly convex, and there is a small spine on the region that corresponds with the distal end of segment 1. The part corresponding to the 2nd segment bears a delicate whip-like outer seta, that reaches almost to the end of the terminal segment.

In the 2nd leg (Text-fig. 27, D) the marginal spine on the 2nd segment of the exopod reaches to the tip of the 1st marginal spine on the 3rd segment, and the 2nd marginal spine on the 3rd segment reaches to the middle of the 3rd spine. The sinus at the base of the 2nd spine is very deep and extends proximal to a line joining the base of the 1st marginal spine and the 2nd inner seta, thus resembling the condition present in *P. rubicunda* Farran.

Distribution.—This species has now been recorded from the Malay Archipelago (A. Scott, under the name *P. barbata*), the Bay of Bengal (Sewell), and the Arabian Sea (present record).

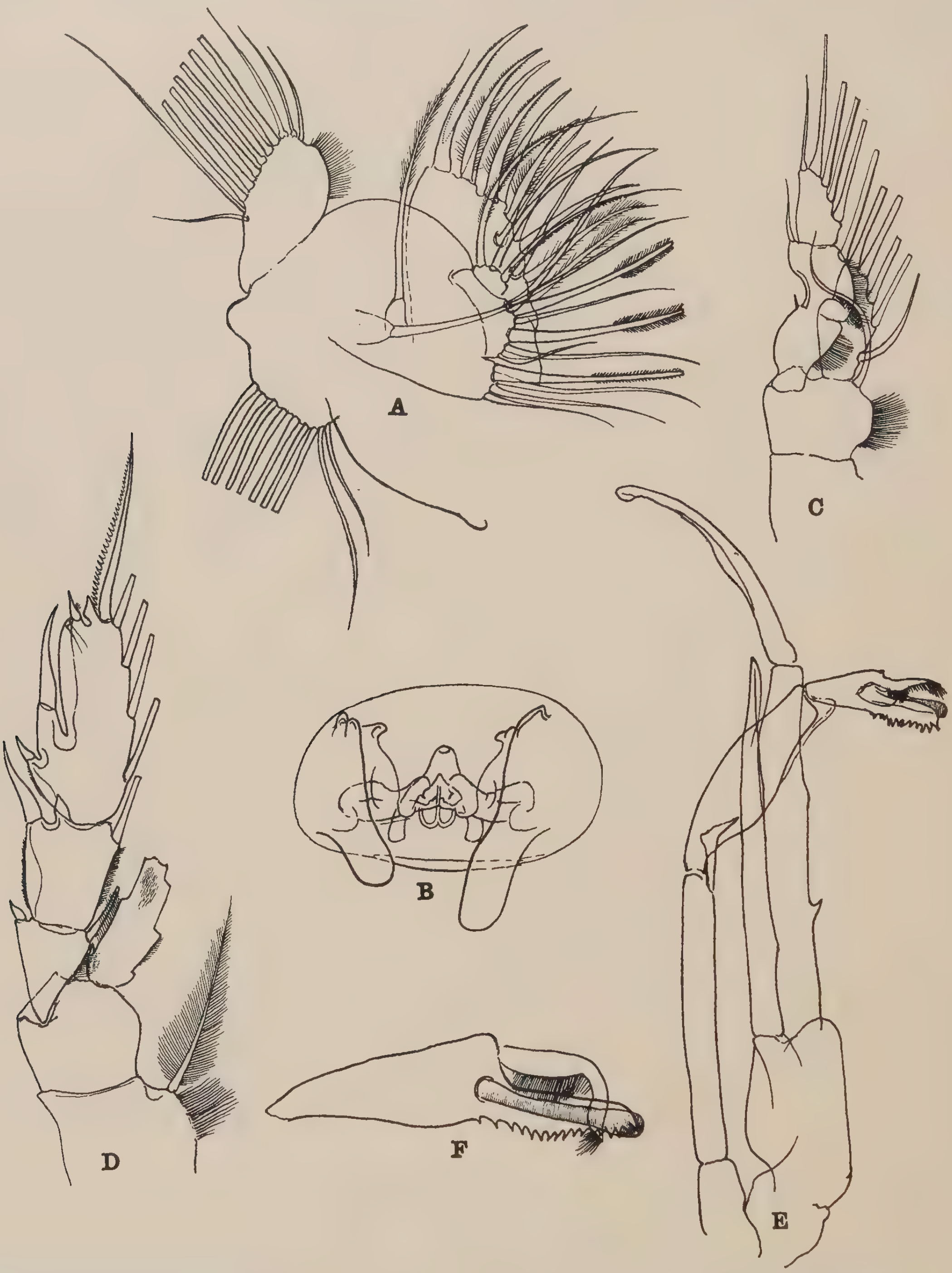
Paraeuchæta weberi A. Scott. (Text-fig. 28, A.)

Paraeuchæta weberi, A. Scott, 1909, p. 74, pl. xv, figs. 9–16; Sewell, 1929, p. 169, text-fig. 63, *a–f*.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., vertical, 4 females.
Sta. 172, Central part of Arabian Sea, 400–0 m., 2 females; 850–0 m., 18 females.
Sta. 186, Gulf of Aden, 600–0 m., 2 females.

REMARKS.—In my (Sewell, 1929, p. 170) description of the maxilla of this species I stated that the 1st inner or masticatory lobe carried 13 setæ, and that the combined 1st and 2nd segments of the endopod carried 7 setæ and the 3rd segment 3; in the present specimen, that I have dissected, the 1st inner lobe bears 12 setæ, the 2nd and 3rd lobes



TEXT-FIG. 28.—*Paraeuchæta weberi* A. Scott. A, 1st maxilla, female. *Paraeuchæta investigatoris* Sewell. B, Genital aperture, female. C, 1st leg, female. D, 2nd leg, female. E, 5th pair of legs, male. F, Clasping organ of left 5th leg, male.

1 each; the 2nd basal segment has 4 setæ, the 1st segment of the endopod bears 6 setæ, and the combined 2nd and 3rd carries 3; the exopod bears 11 setæ and the outer lobe 9, of which the posterior two are smaller than the others. This species thus belongs to the 1st Group.

Distribution.—Up to the present time this species has only been recorded from the Indo-Malayan region. It has been taken in the Malay Archipelago (A. Scott), in the Laccadive Sea (Sewell), the Arabian Sea and Gulf of Aden (present records).

Group II.

Paraeuchæta scotti (Farran). (Text-fig. 28, b–f.)

Euchæte scotti, Farran, 1908, p. 42, pl. iii, figs. 11–13; ? Wolfenden, 1911, p. 301, pl. xxxv, fig. 2, text-figs. 53 *a–c*.
Euchæta scotti, With, 1915, p. 179, pl. vi, figs. 10 *a–c*, text-figs. 51 *a–j*.
Parauchæta scotti, Sars, 1925, p. 116, pl. xxxii, figs. 1–6.

Occurrence.—Sta. 131 D, Central part of Arabian Sea, 500–0 m., 1 female.

Remarks.—Total length, 5·0 mm. The length appears to range from 4·2 to 6·3 mm., according to the locality and perhaps the depth.

In the present specimen the posterior thoracic margin bears a small blunt prominence. The proportional lengths of the abdominal segments are as 39, 23, 22, 5, 12. The genital prominence when viewed from the ventral aspect closely resembles the figure given by Sars (1925, pl. xxxii, fig. 4).

Distribution.—This species has now been taken off the west of Greenland, from Davis Strait to Baffin Bay (Jespersen), in the North Atlantic from lat. 62° 47′ N. (With) and lat. 54° 51′ N. (Lysholm and Nordgaard), off the west coast of Ireland (Farran), near the Azores (Sars) and in the Equatorial region (Wolfenden). The present record extends its distribution to the Arabian Sea.

Group III.

Paraeuchæta bisinuata Sars.

Euchæta bisinuata, Farran, 1908, p. 45, pl. iii, figs. 17–19, pl. iv, fig. 4; A. Scott, 1909, p. 70, pl. xvi, figs. 10–17; With, 1915, p. 183, text-fig. 54 *a–j*, pl. vi, fig. 11 *a–e*; Sars, 1925, p. 123, pl. xxxiii, figs. 16–22.

Occurrence.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.

Distribution.—In the Malay Archipelago (A. Scott). In the Indian Ocean in the Bay of Bengal and Laccadive Sea (Sewell), and the northern area of the Arabian Sea (present record). In the Atlantic Ocean off the Azores (Rose), from the Azores and Canary Islands, on the coast of Portugal and in the Gulf of Gascony (Sars), off the west coast of Ireland (Farran), as far north as lat. 61° 30′ N. (With), and off Greenland (Jespersen).

Paraeuchæta investigatoris Sewell.

Paraeuchæta investigatoris, Sewell, 1929, p. 158, text-figs. 60, *a–d* (♂).
Paraeuchæta californica (*non* Esterly), A. Scott, 1909, p. 71, pl. xv, figs. 1–8; Sewell, 1929, p. 158 (♀).

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 16 females, 4 males.

Sta. 172, Central part of Arabian Sea, 400–0 m., 2 females, 9 males; 850–0 m., 36 females, 9 males.

Sta. 186, Gulf of Aden, 575–0 m., 6 females, 1 male; 600–0 m., 61 females, 14 males.

Descriptive Notes.—This species was recorded by A. Scott (*loc. cit.*) from the Malay Archipelago under the name *P. californica* (Esterly); he obtained females only. The male was described by me from specimens taken in the Bay of Bengal, and to these I gave the name *P. investigatoris*. A study of the examples taken in the present collection has convinced me that the form with which A. Scott was dealing was not identical with that described from the San Diego region by Esterly as *P. californica*. I am also of the opinion that these two forms represent the two sexes of the same species, and therefore the name given to the male must apply also to the female.

♀. Total length, 6·58–7 mm. This is considerably smaller than *P. californica* Esterly, which measured 8 mm. in length. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
305	126	101	81	68	127	76	68	10	38 = 1000

The supra-rostral eminence is low and the rostrum projects markedly forwards. The cephalon is only incompletely fused with the 1st thoracic segment, and the chitin easily splits along the line of fusion. The postero-lateral region of the fused 4th and 5th thoracic segments is produced backwards in a rounded margin, that bears on its inner aspect a somewhat scanty tuft of long hairs. The genital segment is clearly different from that of *P. californica* Esterly, as A. Scott has himself pointed out. The two wings on either side of the genital aperture are much more pronounced in the present species, and are unequal in size, that on the left side projecting further backwards than that on the right: both laminæ project considerably beyond the posterior margin of the genital aperture. Esterly (1906, pl. x, fig. 30) gives a somewhat rough illustration of the ventral view of the genital aperture, and a comparison of this with Text-fig. 28, B reveals that there is not the slightest resemblance between the two forms. Abdominal segments 3 and 4 (the 2nd and 3rd free segments) are armed with scattered small spinules on the dorsal aspect and bear a fringe of long hairs ventrally. Abdominal segment 4 is armed with 4 blunt spines on the dorsal part of the posterior margin. The anal segment bears some long hairs ventrally, and the furcal rami are fringed with long hairs on the lateral and ventral aspects. The 2nd furcal seta is considerably longer than the others, and the proportional lengths of the various setæ are as follows:

Average length of 1st, 3rd and 4th setæ . . .	80
Length of 2nd furcal seta	175
Length of accessory seta	280+

Unfortunately in no case was the accessory seta complete.

The 1st antenna reaches back to about the posterior end of the cephalothorax. The proportional lengths of the various segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.	
56	40	22	21	24	25	26	36	22	23	31	40	42	50	55	53	54	61	65	61	60	62	71	= 1000

The combined 24th and 25th segments are together considerably longer than the 19th segment. The 2nd to 13th segments inclusive bear a row of hairs on their posterior borders.

In the 2nd antenna the 1st basal segment bears a row of long hairs on its inner margin, and an external seta.

The mandible is of the usual type.

In the 1st maxilla the number of setæ arising from the parts of the appendage are as follows :

The 1st inner lobe	13
The 2nd inner lobe	1
The 3rd inner lobe	1
Basal 2	4
Endopod 1	6
Endopod 2–3	3
Exopod	11
Outer lobe	6

In the number of setæ arising from the outer lobe, this species differs from *P. californica* (Esterly), in which there are 7.

♂. The male of this species was described by me (Sewell, 1929, p. 158) from the Bay of Bengal. In the general character of the 5th pair of legs this species closely resembles the males of *P. antarctica* (Giesbrecht) and *P. russelli* (Farran), so far as the shape and armature of the comb-like ridge of the 2nd joint of the exopod of the left leg is concerned. In my original account of this appendage I stated that there was " a line of five teeth on the inner border," but I have been unable to detect these in the present specimens.

Distribution.—This species has now been taken in the Malay Archipelago (A. Scott, as *P. californica*), the Bay of Bengal (Sewell), the Arabian Sea and the Gulf of Aden (present records).

Paraeuchæta sarsi Farran. (Text-fig. 29, a, b.)

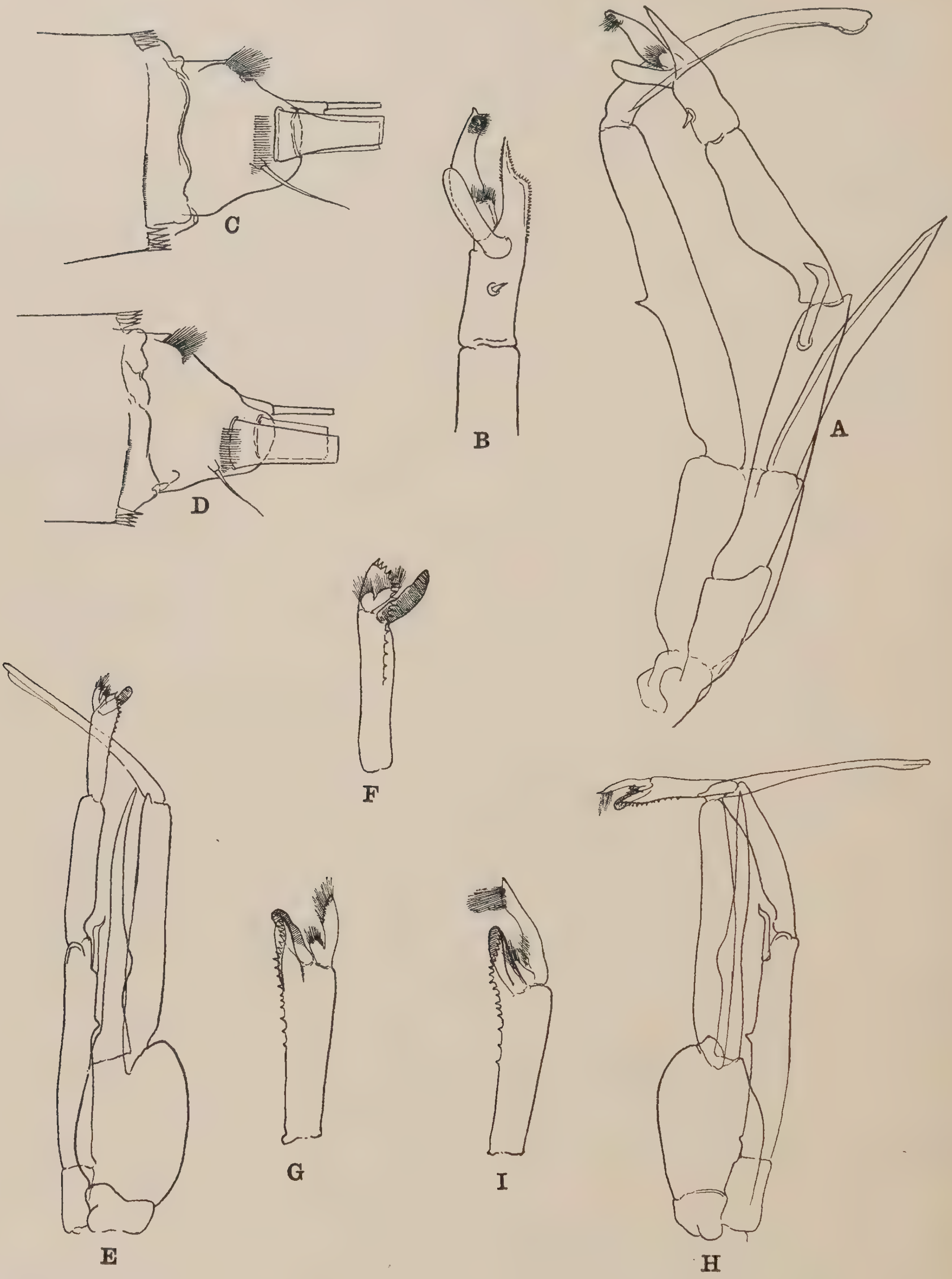
Paraeuchæta sarsi, Farran, 1908, p. 41, pl. iii, figs. 15, 16 ; Sars, 1925, p. 114, pl. xxxi, figs. 8–14.
Euchæta sarsi, With, 1915, p. 177, pl. vi, figs. 7, *a*, *b*, text-figs. 50, *a–f* (♀ only).
non Paraeuchæta sarsi, A. Scott, ♂, 1909, p. 75, pl. xxi, figs. 9–15.

Occurrence :

Sta. 131 A, Southern area of Arabian Sea, 600–0 m., 1 female.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female ; 2500–0 m., 1 female.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female, 1 male.

Remarks.—♀. Total length, 8·47 mm.

The proportional lengths of the cephalothorax and abdomen are as 66 to 40. The



Text-fig. 29.—*Paraeuchæta sarsi* Farran. A, 5th pair of legs, male. B, Clasping organ of left 5th leg, male. *Paraeuchæta spinifera* Esterly. C, Anal segment. *Paraeuchæta tonsa* Giesbrecht. D, Anal segment. *Paraeuchæta spinifera* Esterly. E, 5th pair of legs, male. F, Clasping organ of left 5th leg, male. G, Another view of same. *Paraeuchæta tonsa* Giesbrecht. H, 5th pair of legs, male. I, Clasping organ of left 5th leg, male.

proportional lengths of the various segments of the body, measured in the mid-dorsal line, are as follows:

Cephalon. Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1-2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
415	84	84	78	133	76	71	12	47 = 1000

The rostrum is directed forwards. The posterior thoracic margin is somewhat acutely rounded. The genital segment shows no trace of any lateral tubercle. The proportional lengths of the 3rd and 4th furcal setæ, the 2nd furcal seta and the accessory seta are as 1 : 2·5 : 8·3.

♂. The single specimen of the male was slightly damaged, but the 5th pair of legs were intact (Text-fig. 29, A). These agree closely with the description and figures given by Sars (1925, pl. xxxi, figs. 13, 14), but differ from the accounts given by A. Scott (1909, pl. xxi, fig. 15); the spinous process of the terminal segment of the left leg (Text-fig. 29, B) is sharply constricted at about two-thirds of its length and then tapers to a sharp point, whereas in Scott's figure this process is shown as bluntly rounded; the middle smooth, bluntly rounded process in the present specimen is distinctly, though slightly, shorter than the spinous process, whereas With shows it as considerably longer in the specimens that he took to be the male of this species. The male described by A. Scott (1909) appears to me to correspond to the form described by Sars (1925, pl. xxxi, figs. 5–7) as the male of *P. barbata* Brady, and earlier by With (1915, pl. vi, fig. 8 *b*) under the same name.

DISTRIBUTION.—The species has now been taken in the Malay Archipelago (A. Scott), the Arabian Sea (present records), the North Atlantic (Sars), off the coast of Ireland (Farran), as far north as 61° 30′ N. (With), and South of Davis Strait (Jespersen).

? *Paraeuchæta spinifera* Esterly. (Text-fig. 29, C, E, F and G.)

Euchæta spinifera, Esterly, 1906, p. 62, pl. ix, fig. 8, pl. xi, fig. 35, pl. xiv, figs. 82, 83.
Paraeuchæta spinifera, A. Scott, 1909, p. 75, pl. xxii, figs. 9–16.

OCCURRENCE.—Sta. 172, Central area of Arabian Sea, 850–0 m., 1 male.

DESCRIPTIVE NOTES.—♂. This single specimen exhibits a close resemblance to the form very briefly described and inadequately figured by Esterly from the San Diego region of the coast of California.

♂. Total length, 6·28 mm.

Esterly's original example measured 5·1 mm. A. Scott (1909) obtained in the "Siboga" collection a single specimen that he doubtfully referred to this species, and that measured 5·5 mm. If A. Scott and I are correct in referring our examples to Esterly's species, it would appear that there is a progressive increase in size as we pass from east to west.

The proportional lengths of the various segments of the body are as follows, and for the purpose of comparison I have given the corresponding measurements in *Paraeuchæta tonsa*:

	Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
spinifera	407	82	82	75	66	91	101	59	13	24 = 1000
tonsa	392	85	79	78	69	93	101	66	13	24 = 1000

Esterly states that in the abdomen of *spinifera* "the genital and anal segments (are) equal in length, the second longer than any other and nearly as long as the last two." This description is clearly inaccurate and misleading, for in all the Euchætidæ the anal segment is remarkably short and is telescoped into the 4th segment. Presumably what Esterly meant is that the genital segment and the 4th abdominal segment are equal, and the second segment is equal to the 3rd and 4th together. In the present specimen the first holds good, but the 2nd segment is actually shorter than the 3rd and very much shorter than the 3rd and 4th together. It is clear that there is little or no difference between the present specimen and *Paraeuchæta tonsa* in the proportions of the body, and the same is true of many other characters.

Esterly has described the presence on the posterior margin of the thorax in the dorso-lateral region of a short spine, and it is, presumably, this character that is referred to in the specific name, *spinifera*; an exactly similar spine is present in the males of *Paraeuchæta tonsa*, *P. investigatoris* and *P. malayensis*.

In both *tonsa* and *spinifera* the posterior thoracic margin is very slightly more produced, and is more sharply rounded on the left side than on the right; in both forms there is an absence of any tuft of hair on the margin. The proportions of the abdominal segments are almost identical, such slight differences as are indicated above being within the limits of individual variation. In both forms the 2nd, 3rd and 4th segments are fringed on their dorsal and ventral aspects with triangular spinules, but the lateral aspects are smooth, except in the 4th segment, where in each form there is a row of minute spinules. In both the 2nd furcal setæ are about twice the length of the others, and the accessory seta is about 1½ times the length.

The 1st antenna consists of the usual 21 joints, segments 8–10 and 12–13 being fused, as well as the 24 and 25 segments. The proportional lengths of the various segments in these two species are as follows:

Segment.	1.	2.	3.	4.	5.	6.	7.	8–10.	11.	12–13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.
spinifera	51	41	19	20	24	27	32	67	21	67	37	45	54	57	59	72	71	60	58	51	66 = 1000
tonsa	51	41	19	20	24	27	32	68	22	67	37	43	53	55	59	72	71	62	59	52	66 = 1000

The 2nd antenna and mouth parts appear to be identical in this form and in *P. tonsa*.

The swimming legs also appear to be identical.

In the 5th pair of legs (Text-fig. 29, E–G) the sole difference appears to lie in the clasping "hand" of the terminal segment of the left exopod. In *spinifera* the dentate lamella is not so acutely pointed as in *tonsa*; the "dactylus" is considerably shorter than in *tonsa*.

If I am right in thinking that this specimen is a representative of the form *P. spinifera* Esterly, it would appear to be extremely doubtful whether this species can justifiably be separated from *P. tonsa*, and I am inclined to regard Esterly's form as a local variation characteristic of the Pacific Ocean but extending as far as the Indian Ocean, and the form described by With as the male of *P. tonsa* as the Indo-Atlantic form.

DISTRIBUTION.—This form has now been recorded from the San Diego region of the

Californian coast, where it was taken in a haul with several examples of *Paraeuchæta tonsa* (Esterly) ♀, from the Malay Archipelago (A. Scott) and from the Arabian Sea (present record).

Paraeuchæta tonsa Giesbrecht. (Text-fig. 29, D, H and I.)

Euchæta tonsa, Giesbrecht, 1895, p. 251, pl. iv, figs. 9, 10; Esterly, 1906, p. 64, pl. ix, fig. 10, pl. x, fig. 32; With, 1915, p. 166, pl. vi, figs. 4 *a*, *b*, text-figs. 46 *a–g*.
Paraeuchæta tonsa, A. Scott, 1909, p. 72, pl. xiv, figs. 8–15; Sars, 1925, p. 122, pl. xxxiii, figs. 9–15.

OCCURRENCE:

Sta. 96, Central part of Arabian Sea, 645–400 m., 1 male.
Sta. 131 D, Central part of Arabian Sea, 1500–0 m., 1 male.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 male.

REMARKS.—♂. Total length, 6·167 mm.

This is slightly larger than the specimens taken by the "Thor" Expedition in the North Atlantic Ocean, which measured 5·89 mm.

The structure of the grasping "hand" of the exopod of the 5th left leg (Text-fig. 29, H, I) agrees closely with the figure given by Sars (1925, pl. xxxiii, figs. 13–15).

DISTRIBUTION.—In the Pacific Ocean, in the San Diego region of the Californian coast (Esterly), in the east Pacific region (Giesbrecht), and in the Malay Archipelago (A. Scott). In the Indian Ocean in the Arabian Sea (present records) and beneath the Agulhas Current (Cleve). In the South Atlantic Ocean (Wolfenden), in the North Atlantic Ocean (Wolfenden, Sars, Rose), off the west coast of Ireland (Farran), and to the south and west of Iceland (With).

Paraeuchæta withi sp. nov. (Text-fig. 30, A–C.)

Euchæta sarsi (♂), With, 1915, p. 178, pl. vi, fig. 7*b*.

OCCURRENCE.—Sta. 131 D, Central part of Arabian Sea, 1500–0 m., 1 male.

DESCRIPTIVE NOTES.—♂. This single specimen clearly agrees with the form that With attributed to *Paraeuchæta sarsi* Farran. In his account of this species With remarks, "that the described females are identical with *E. sarsi* Farran, I regard as quite evident; in contrast to Farran I do not regard it as identical with Wolfenden's *E. barbata*. The described male is certainly different from that which has been referred to *E. barbata*, and belongs certainly to *E. sarsi* or another species of similar size nearly related to it. I do not think that the male, which A. Scott refers to *E. sarsi*, is identical with the described one, on account of the well-developed lateral dorsal teeth of the fifth thoracic tergite and the different shape of the serrated process."

The total length of the present specimen is 8·40 mm.; With gives the length of his example as 8·3 mm.

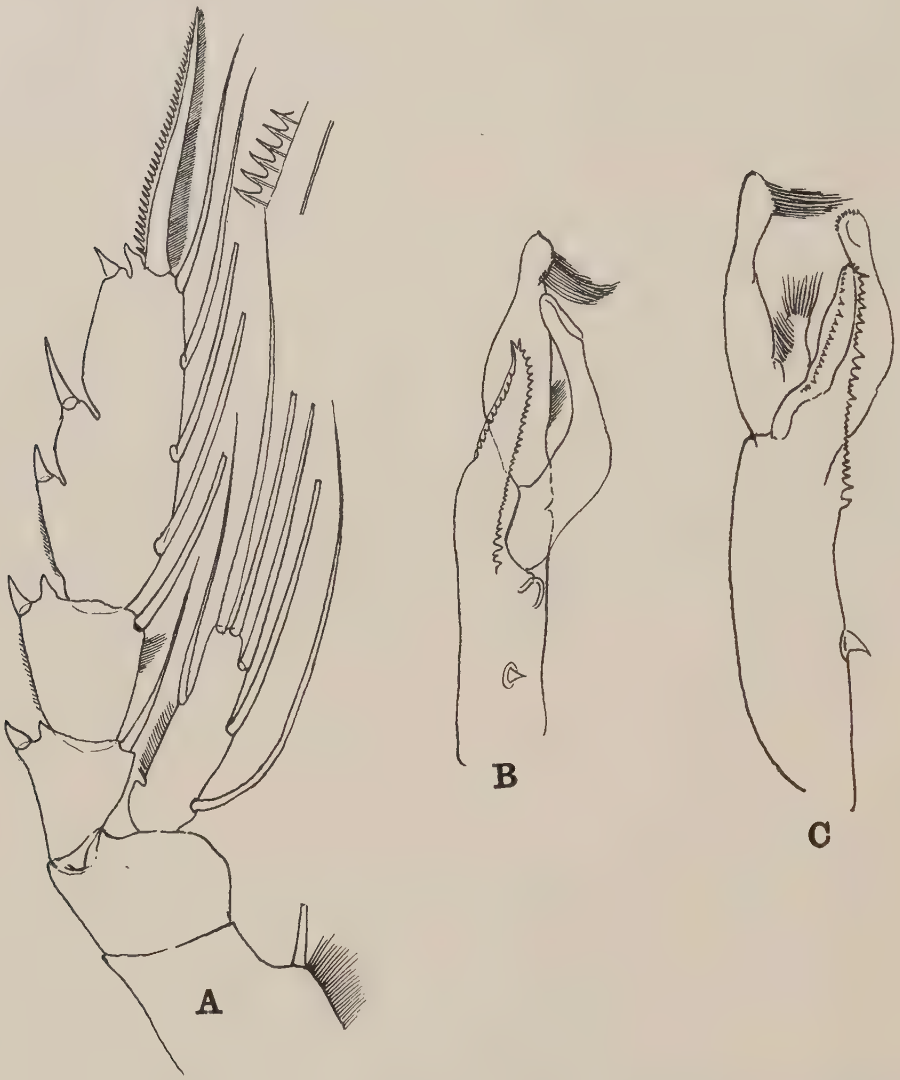
The proportional lengths of the anterior and posterior regions of the body are as 67 to 33.

As in With's specimens, the rostrum is directed forwards and the dorso-lateral tooth of the 5th thoracic segment is poorly developed. The posterior thoracic margin is produced somewhat backwards into a slight wing.

In the 1st swimming leg the marginal spine on the 1st segment of the exopod is completely absent.

A comparison of Text-fig. 30, B, C, with that given by With (1915, pl. vi, fig. 7*b*) clearly indicates the identity of the two examples.

Distribution.—This form has now been recorded from the north Atlantic Ocean (With) and the Arabian Sea (present record).



Text-fig. 30.—*Paraeuchæta withi* sp. nov., male. A, 2nd leg. B, Clasping organ of left 5th leg. C, Another view of same.

Family Phænnidæ.

Genus *Xanthocalanus* Giesbrecht.

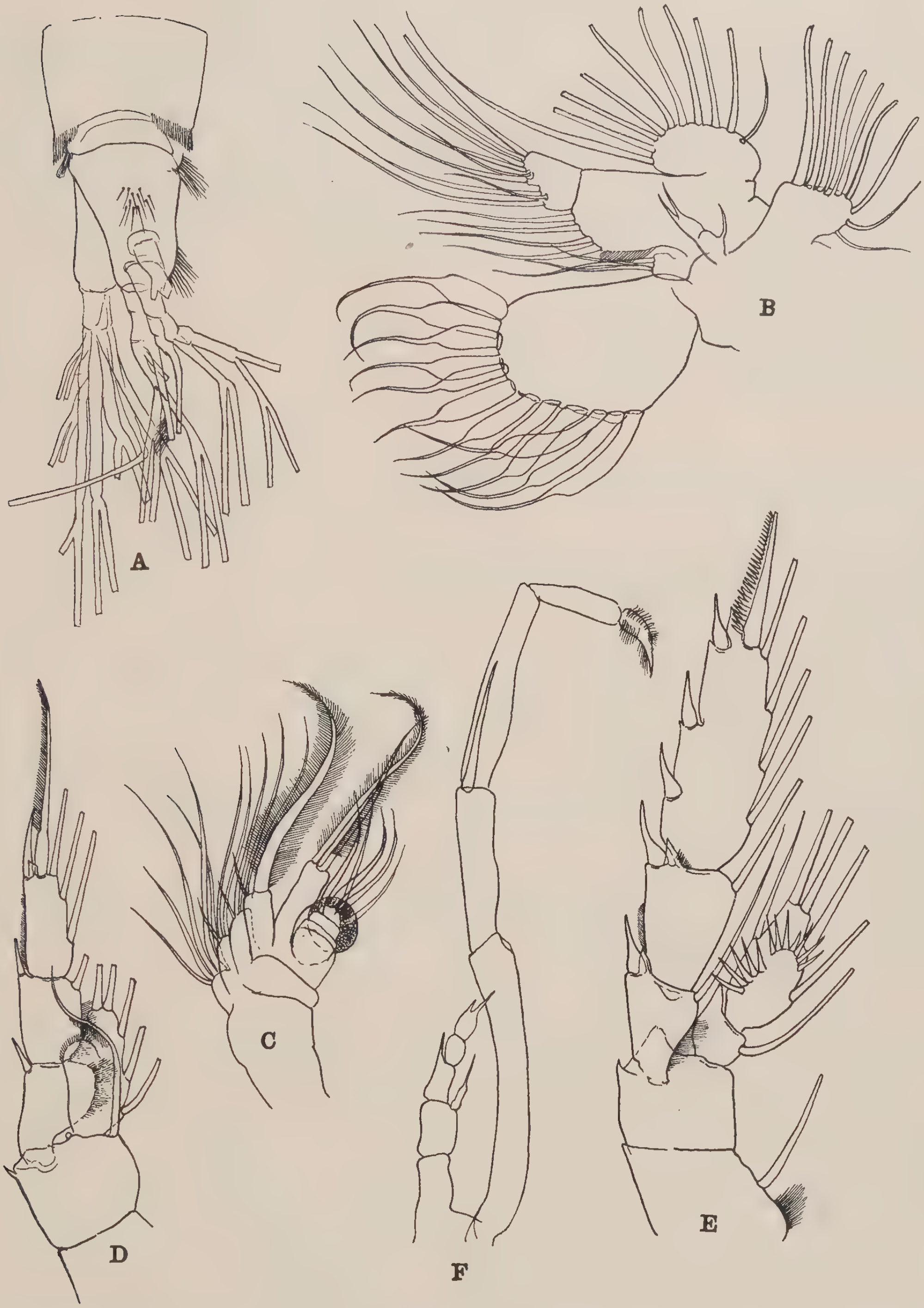
Xanthocalanus, Giesbrecht, 1892, p. 286.

Xanthocalanus greeni Farran. (Text-fig. 31, A–F.)

Xanthocalanus greeni, Farran, 1905, p. 39, pl. viii, figs. 1–13; Sars, 1925, p. 132, pl. xxxvi, figs. 1–18.

Occurrence.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 male.

Remarks.—♂. Total length, 7·1 mm.



TEXT-FIG. 31.—*Xanthocalanus greeni* Farran, male. A, Anal segment and furcal rami. B, 1st maxilla. C, 2nd maxilla. D, 1st leg. E, 2nd leg. F, 5th pair of legs.

This is somewhat larger than the example described by Sars, which measured 6·5 mm. With (1915, p. 235) has described what he took to be a male of this species in the Vth Copepodid stage, which measured as much as 8·12 mm. in length.

The present specimen agrees extremely closely with the description and figures given by Sars (*loc. cit.*). The forehead is arched, but shows no trace of a crest. The rostrum forms a wide prominence that terminates in a pair of long slender spines. The line of demarcation between thoracic segments 4 and 5 is clearly visible, and the posterior thoracic margin is produced backwards beyond the posterior border of the 1st abdominal segment in a broad wing, that has a small angular prominence in the dorso-lateral region. The proportional lengths of the various segments of the body, measured in the mid-dorsal line, are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
438	101	79	67	45	46	63	52	49	11	49 = 1000

Both the anal segment and the furcal rami are hairy on their ventral aspects (Text-fig. 31, A). Most of the furcal setæ have undergone dichotomous branching.

Both the 1st antennæ are broken off about the middle of their length, but the proximal segments are somewhat swollen and are provided with " æsthetascs."

In the 2nd antenna the 1st basal segment is provided with a fringe of long hairs internally. The exopod is slightly longer than the endopod.

The 1st maxilla (Text-fig. 31, B) agrees exactly with the figure given by Sars. The number of setæ on the various parts are as follows :

Li. 1 is expanded and bears 11 or 12 fleshy setæ.
Li. 2 in the stained specimen appears to be composed of two segments, of which the proximal bears a single seta and the distal two setæ.
Li. 3 bears 3 setæ.
Basal II bears 4 setæ and is fringed along its inner margin with hairs.
The endopod is fused into a single segment and bears 3, 3, and 3 setæ.
The exopod bears 10 setæ.
Le. bears 7 large setæ and posteriorly 2 other smaller ones.

The 2nd maxilla (Text-fig. 31, C) agrees closely with Sars' figure and description.

The swimming legs also agree closely with Sars' description and figures.

The 5th pair of legs (Text-fig. 31, F) is identical with Sars' account. The right leg is very small, and does not extend as far as the distal margin of the 1st basal segment of the left leg : it consists of the usual number of segments ; basal 2 bears a small seta-like endopod ; exopod 1 bears a single marginal seta, and exopod 3 terminates in 2 unequal setæ. In the left leg the 2nd basal segment bears a spine-like endopod, and the 3rd segment of the exopod is somewhat pyriform and hairy. This appendage is entirely different from the account given by Wilson (1932, p. 69, fig. *b*) of the appendage in what he took to be the male of this species. It seems obvious that he was dealing with a male of an entirely different species.

Occurrence.—This species has previously been recorded from the Atlantic Ocean south of Iceland (With), off the west coast of Ireland in depths of 680–1150 fathoms (Farran), and in the Bay of Biscay (Wolfenden). The present record extends the distribution to the Arabian Sea.

Genus *Onchocalanus* Sars.

Onchocalanus, Sars, 1905*a*, p. 19.

Onchocalanus affinis With. (Text-figs. 32, A–G, 33, A–E.)

Xanthocalanus magnus, Wolfenden, 1908, p. 37, pl. vii, figs. 1–9.
Onchocalanus hirtipes, A. Scott, 1909, p. 83, pl. xxxiv, figs. 9–17 (*non* Sars).
Onchocalanus magnus, Wolfenden, 1911, p. 275, pl. xxxi, figs. 3–5.
Onchocalanus affinis, With, 1915, p. 233, text-figs. 75, *a–e*, and 76, *a–d*; Sars, 1925, p. 150, pl. xli, figs. 12–18.

OCCURRENCE:

Sta. 76, Gulf of Oman, 1500–0 m., 1 juv. (Stage IV).
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female and 1 male, juv. (Stage V).

DESCRIPTIVE NOTES.—♀. Total length, 5·133 mm.

The proportional lengths of the various segments of the body, measured in the mid-dorsal line, are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
325	149	115	93	62	118	62	43	7	26 = 1000

The forehead is not produced forwards and is evenly rounded: there is no trace of any crest. The rostrum is a pair of strong spines directed downwards and somewhat backwards. The line of demarcation between the cephalon and the 1st thoracic segment is clearly visible dorsally, though it is incomplete laterally; the line of demarcation between the 4th and 5th thoracic segments is also clearly visible. The posterior thoracic margin is produced backwards into a bluntly rounded wing without a terminal spine, though there is a very small trace of a backward projection. The 1st abdominal segment is expanded opposite the genital orifice, and from thence backwards is of the same uniform diameter. There are some small short hairs around the genital orifice. The ventral aspect of segment 4 is hairy, and there are some spinules on the dorsal aspect of the furcal rami.

The 1st antenna reaches back to beyond the posterior margin of the genital segment. The proportional lengths of the segments are as follows:

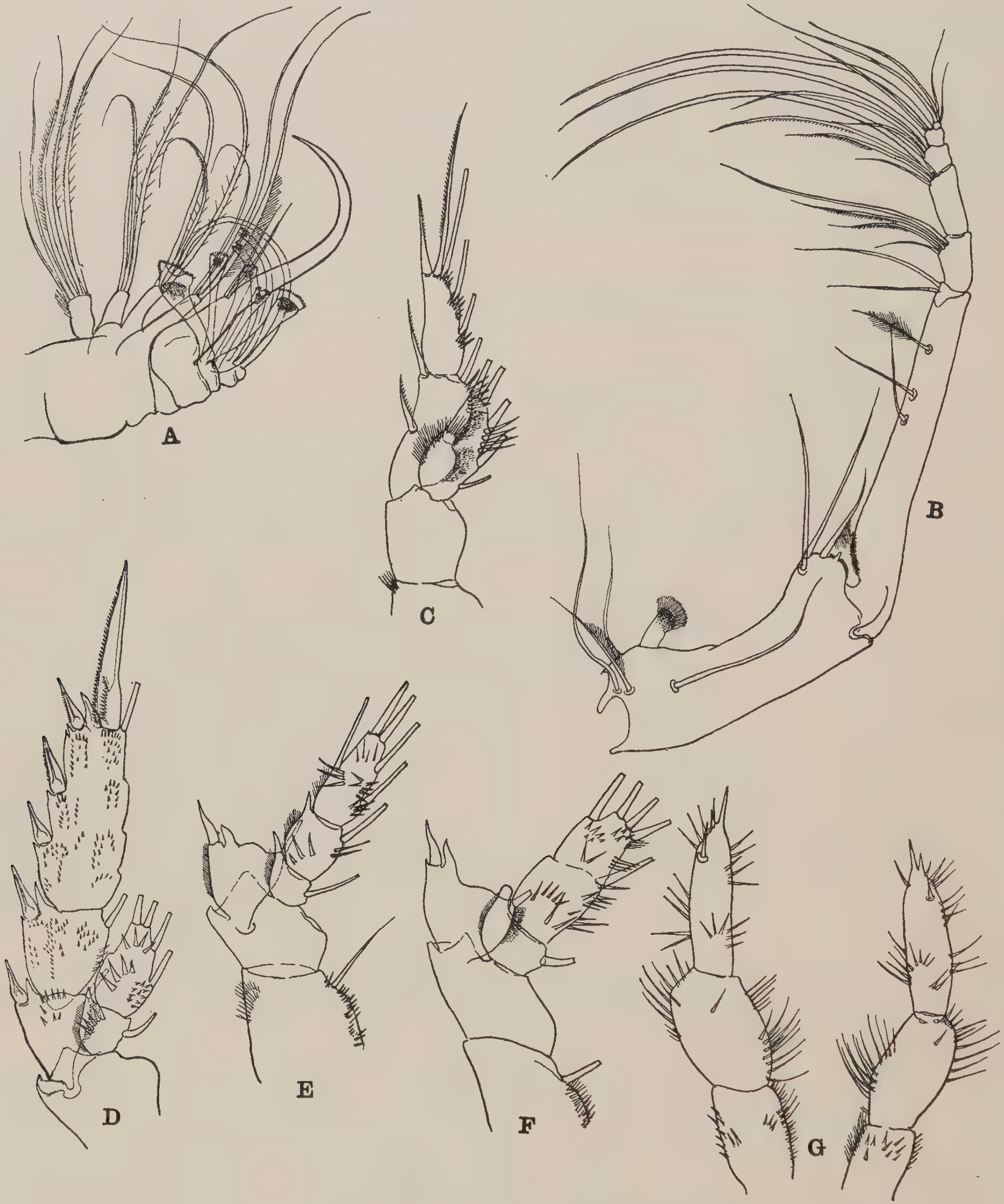
Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
63	38	26	26	27	27	27	37	22	26	26	43	47	59	60	60	54	53

20.	21.	22.	23.	24.	25.
52	45	45	55	60	22 = 1000

The seta on segment 24 is inserted at the junction of the middle and distal thirds of the joint.

In the 2nd antenna the two rami are of nearly equal length. The exopod consists of six segments, of which the 1st is produced in a rounded eminence.

In the mandible the biting ramus is long and somewhat weak; the teeth are small and the posterior ones are crenulate. The 2nd basal segment bears 3 setæ. Endopod 1 bears 2 setæ and the terminal segment carries 9. The exopod bears 1, 1, 1, 1, and 4 setæ on the several segments.



Text-fig. 32.—*Onchocalanus affinis* With, ♀. A, 2nd maxilla. B, Maxilliped. C, 1st leg. D, 2nd leg. E, 4th leg, right. F, 4th leg, left. G, 5th leg.

In the 1st maxilla the various lobes bear the following spines and setæ :

Inner lobe I . .	9 ?, the spines are longer than the lobe itself.
Inner lobe II .	?
Inner lobe III .	4

Basal II	5
Endopod I	3
Endopod II	3
Endopod III	4
Exopod	10
Outer lobe	9

In the 2nd maxilla (Text-fig. 32, A) two of the sensory appendages, arising from the terminal part of the appendage are markedly stouter than the others.

The lengths of the various parts of the maxilliped (Text-fig. 32, B) are in the following proportions:

1st basal segment	36
2nd basal segment	42
Endopod	22

With (*loc. cit.*, p. 234) gives the lengths in his specimen as 85, 100 and 57, which reduced to the same proportional lengths corresponds to 35, 41 and 24; there is thus but little difference between the two examples. The sensory appendage arising from the 1st basal segment is larger than in most other species, and appears to arise nearer the proximal end of the segment.

In the 1st leg (Text-fig. 32, C) the exopod is composed of 3 segments, each bearing a well-developed marginal spine; the 2nd segment has a group of 7 spines and the 3rd segment bears three groups of 3, 6 and 5 spines respectively: With states that there were 3, 6 and 6 spines in these groups in his example.

Remarks.—A comparison of the description and figures given above with those of With and Sars indicates that we were all three dealing with the same species. There is also in my mind no doubt that the form described by A. Scott from the Malay Archipelago under the name *O. hirtipes* belongs to this species and not to that of Sars. It further appears to be probable that the examples taken by the "Terra Nova" in the Antarctic and described by Wolfenden under the name *Xanthocalanus magnus* belong to this species and not to the true *O. magnus* Wolfenden; this latter species, which he described from the region off the west coast of Ireland, is much larger, and according to Sars is synonymous with *O. trigoniceps* Sars.

Accompanying this adult female were examples in Copepodid Stages V and IV.

Stage V. Total length, 4·50 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 to 24.

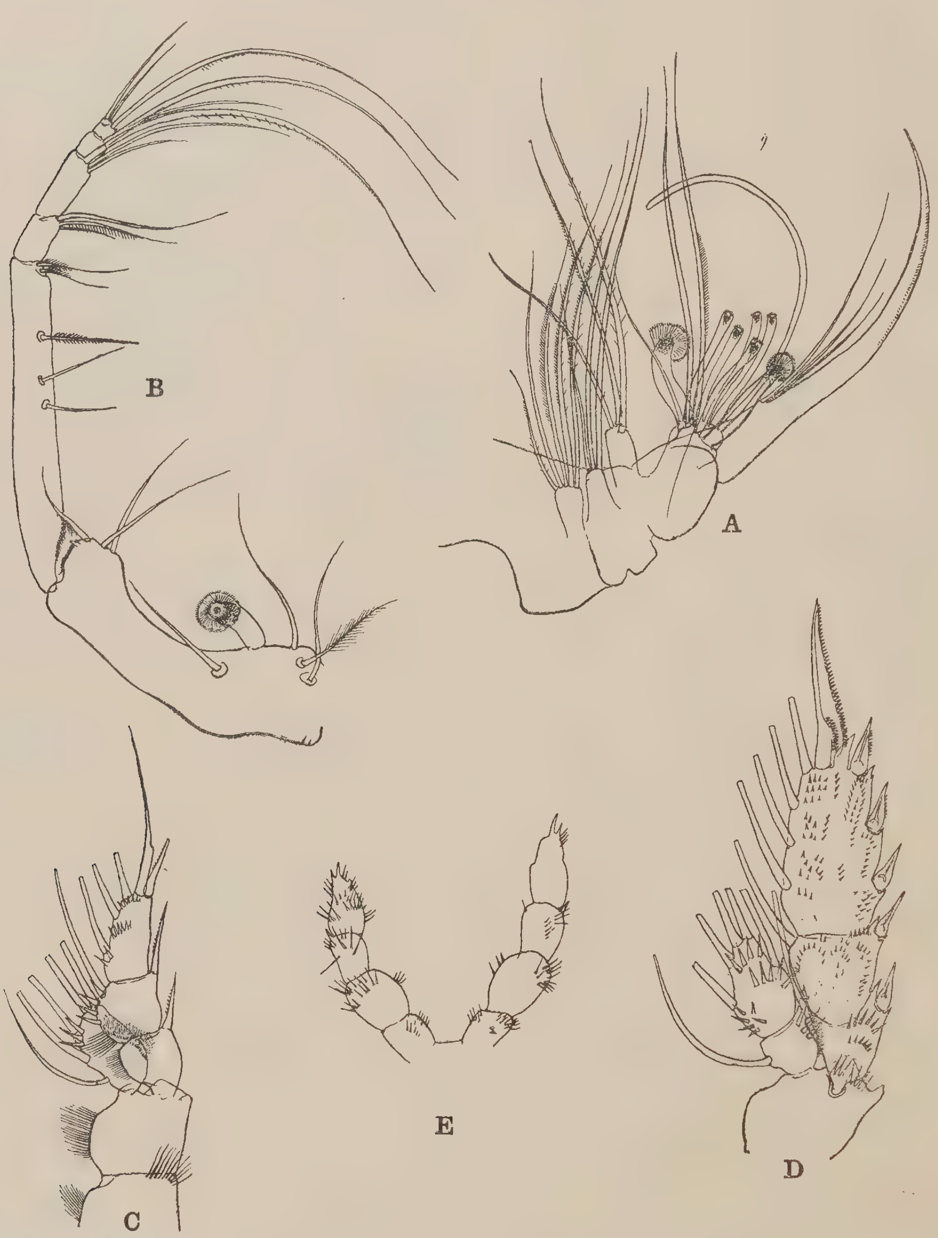
The proportional lengths of the various segments of the body are given below. The forehead is rounded, as in the adult. The posterior thoracic margin is produced backwards in a wing, the distal part of which narrows to a bluntly rounded eminence that is slightly curved downwards, but does not exhibit a spinous projection. The abdomen is composed of only four segments, segments 4 and 5 not yet being demarcated.

The 1st antenna reaches back to about the middle of the abdomen; it consists of 24 free segments that have the following proportional lengths:

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
72	39	25	25	27	27	27	37	23	25	27	42	46	46	58	56	53	52	53	48	46	58	63	25 = 1000

The 2nd antenna and mouth-parts appear to be similar to those of the adult. In the 2nd maxilla (Text-fig. 33, A) the sensory setæ on the terminal portion are already fully developed.

The maxilliped (Text-fig. 33, B) closely resembles that of the adult.



Text-fig. 33.—*Onchocalanus affinis* With, ♂, juv. A, 2nd maxilla. B, Maxilliped. C, 1st leg. D, 2nd leg. E, 5th pair of legs.

The swimming legs (Text-fig. 33, C, D) are fully developed and resemble those of the adult.

The 5th pair of legs (Text-fig. 33, E) differ from those of the adult in that the terminal segment is partially subdivided into two on each side, thus resembling the immature form of *O. trigoniceps*.

Stage IV. Total length, 3·50 mm.

The proportional lengths of the various segments of the body are given below.

The sensory setæ on the 2nd maxilla and the maxilliped are already fully developed, and as in the adult, two are much stouter than the others.

The 5th pair of legs is composed of three segments, as in the adult.

It is interesting to compare the changes in the proportional lengths of the various segments of the body in these three successive stages of development :

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca
Stage IV	371	148	93	86	51	28	56	70	70			27
Stage V	342	144	101	86	54	32	58	68	54	36		25
Stage VI	324	145	108	90	56	31	111		62	40	9	25

These measurements strongly suggest that there is a comparative reduction in the length of the cephalon at each successive moult, whereas in the 2nd–5th thoracic segments the opposite is taking place, the segment tending to increase in length at each successive ecdysis. In the abdomen such changes as are taking place in the relative lengths of the segments are somewhat obscured by the simultaneous changes in the segmentation ; but whereas the 1st and 2nd segments present but little difference, the 3rd–5th segments greatly increase in length, the sum of the lengths of these segments increasing from 70 in Stage IV, to 90 (54 + 36) in Stage V and 111 (62 + 40 + 9) in Stage VI ; during the same moults there seems to be a very slight shortening of the furcal rami.

Distribution.—The North Atlantic Ocean, lat. 61° 30′ N. (With) and off the Azores (Sars). From the Antarctic Seas (Wolfenden, as *Xanthocalanus magnus* and *Onchocalanus magnus*). From the Arabian Sea (present record) and the Malay Archipelago (A. Scott), as *Onchocalanus hirtipes*).

Onchocalanus trigoniceps Sars. (Text-fig. 34, A–G.)

Onchocalanus trigoniceps, Sars, 1905*a*, p. 20 ; 1925, p. 144, pl. xl, figs. 1–17 ; Sewell, 1929, p. 176.
Xanthocalanus magnus, Wolfenden, 1906, p. 32, pl. x.
Onchocalanus frigidus, Wolfenden, 1911, p. 276.
Onchocalanus magnus, With, 1915, p. 225, pl. vii, figs. *a–g*, pl. viii, figs. 16 *a–d*.

Occurrence :

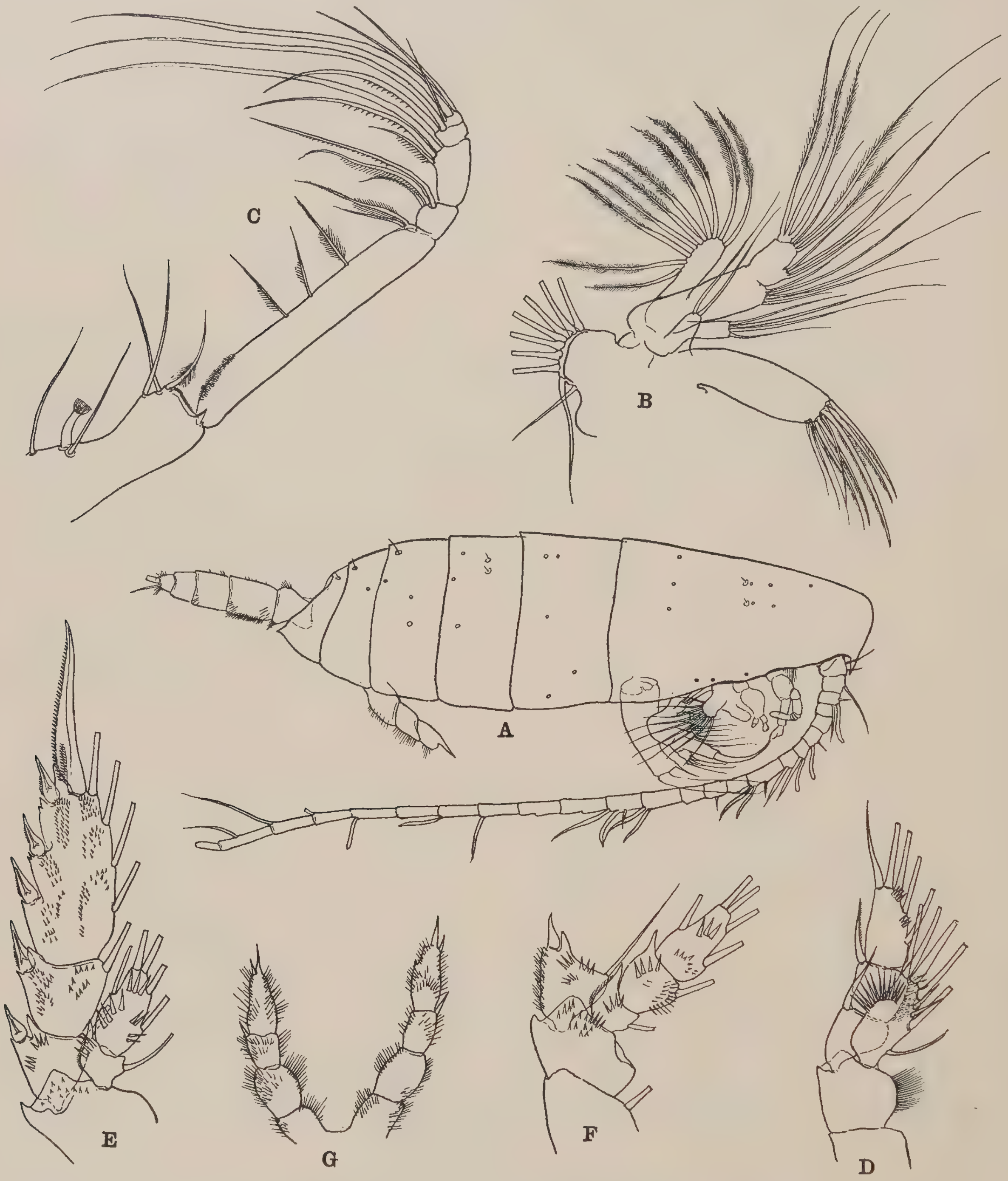
Sta. 96, Central part of Arabian Sea, 645–400 m., 1 juv. (♂ ?).
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female, 6 juv. (♂ ?).

Descriptive Notes.—♀. Total length, 7·33 mm.

The proportional lengths of the cephalothorax and abdomen (Text-fig. 34, A) are as 77 to 23. Sars' examples measured 7·5 mm. and those of With 8·3 mm. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1-2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
370	148	91	82	42	20	106	69	42	7	23 = 1000

The cephalon and 1st thoracic segments are partly fused, the line of separation being visible dorsally ; the 4th and 5th thoracic segments are separated by a line that is clearly visible. The rostrum is composed of two stout spinous processes directed vertically downwards and slightly backwards and, in this specimen, were without any filamentous prolongation. The forehead is prominent but without any trace of a crest. The posterior thoracic margins are prolonged backwards in a triangular flap, at the apex of which is a short spinous projection. A number of small pores, passing through the exoskeleton, are present on the cephalon and thoracic segments in the position shown in the figure.



Text-fig. 34.—*Onchocalanus trigoniceps* Sars. A, Female, lateral view (Stage V). B, 1st maxilla. C, Maxilliped. D, 1st leg. E, 2nd leg. F, Basal portion, 3rd leg. G, 5th pair of legs, immature male.

The genital segment of the abdomen is produced ventrally, and on either side of the genital orifice is a flap that is sharply pointed at its anterior end. The genital orifice is surrounded by an area that is profusely covered with short hairs. The posterior segments are hairy. The furcal setæ are badly damaged, but at least two were abnormal and exhibited dichotomous branching.

Unfortunately both 1st antennæ are broken ; the proportional lengths of the segments that are present are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
66	33	28	28	31	31	31	44	24	28	32	41	47	56	56	55	53	50

The appendages agree very closely with the description and figures given by Sars.

Copepodid stage V. Accompanying this female were 6 examples in the last copepodid stage.

♂. Total length, 5·77 mm.

The proportional lengths of the cephalothorax and abdomen are as 75 to 25. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
372	127	87	83	57	20	66	74	63	27	24 = 1000

The cephalothorax resembles that of the female ; the forehead is prominent and the rostrum is composed of two spines, each without any terminal filament. In the abdomen the 1st and 2nd segments are separate, and the 4th and 5th are fused. The segments are covered with short hairs. In most examples the furcal setæ were broken off, but none showed any abnormal dichotomy.

The 1st antenna reaches back beyond the furcal rami. The proportional lengths of the various segments are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
70	32	23	23	29	29	29	41	23	28	32	41	47	60	60	60	54	53

20.	21.	22.	23.	24.	25.
52	43	43	54	57	17 = 1000

The 2nd antenna and mouth parts agree closely with those of the adult female. In the 2nd maxilla the setæ arising from the distal part of the appendage are modified into sensory organs, as in the adult female.

The swimming legs also resemble those of the female.

The 5th legs (Text-fig. 34, G) are each composed of four segments, instead of three as in the female ; they thus agree closely with the figure given by With (1915, pl. viii, fig. 17 *f*) of this appendage in a young example of *O. cristatus*, and by Esterly (1906, pl. xiii, fig. 77) of *Xanthocalanus similis*, which is a synonym of *O. cristatus*.

With regards the young forms that he examined, and which appear in their structure to correspond with the above immature specimens, to be immature females, probably on account of the presence on the 2nd maxilla of the modified setæ, that are so characteristic of the adult female ; I am, however, inclined to regard them as immature males.

Distribution.—The North Atlantic in lat. 61° 30′ N. (With), to the south of Davis Strait (Jespersen), in the Bay of Biscay and off the coast of Portugal, round the Azores and in the western part of the Mediterranean Sea (Sars, Rose); in the Antarctic seas (Wolfenden); and in the Arabian Sea (present record), and the Laccadive Sea (Sewell).

Family Scolecithricidæ.

Genus *Scolecithricella* Sars.

Scolecithricella, Sars, 1903, p. 54.

Scolecithricella pearsoni Sewell.

Scolecithricella pearsoni, Sewell, 1914, p. 217, pl. xvii, figs. 6, 7, pl. xviii, figs. 1–4.

Occurrence.—Sta. 61 A, Northern area of Arabian Sea, surface.

Descriptive Notes.—Total length, 1·10 mm.

Distribution.—The Ceylon Pearl Banks (Sewell), and the northern area of the Arabian Sea (present record).

Scolecithricella tenuiserrata (Giesbrecht).

Scolecithrix tenuiserrata, Giesbrecht, 1892, p. 266, pl. xiii, figs. 13, 16, 24, 25, 39; pl. xxxvii, figs. 4, 12.

Occurrence.—Sta. 61 C, Northern part of Arabian Sea, surface, 1 female.

Distribution.—Originally described from the Mediterranean Sea (Giesbrecht, Rose), it has since been taken on the Australian Barrier Reefs (Farran) and the Arabian Sea (present record).

Genus *Scottocalanus* Sars.

Scottocalanus, Sars, 1905*b*, p. 7.

Scottocalanus dauglishi Sewell.

Scottocalanus dauglishi, Sewell, 1929, p. 189, text-figs. 68, *a–l*, and 69, *a–c*.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 59 females, 34 males.
Sta. 145 C, Maldive area, 50–0 m. vertical, 1 female; 500–0 m. vertical 4, females.
Sta. 145 D, Maldive Area, 300–0 m. vertical, 3 females, 3 males; 500–0 m. vertical, 9 females, 1 male.
Sta. 172, Central part of Arabian Sea, 400–0 m., 76 females, 57 males.
Sta. 186, Gulf of Aden, 575–0 m., 4 females, 5 males; 600–0 m., 56 females, 21 males.

Remarks.—This is by far the most common species in the genus in the area under investigation.

Distribution.—This species was previously known from the Bay of Bengal and Laccadive Sea (Sewell), and the present records extend its range to the Arabian Sea and the Gulf of Aden.

As regards its depth distribution, it seems clear that it is most common at a depth of some 400–600 metres, though it may be taken as high up as 50 metres depth.

Scottocalanus helenæ (Lubbock).

Undina helenæ, Lubbock, 1856, p. 25, pl. iv, fig. 4, pl. v, figs. 1–5.
Scolecithrix securifrons (♂), T. Scott, 1894, p. 47, pl. iv.
Scottocalanus helenæ, A. Scott, 1909, p. 111, pl. xxvii, figs. 1–9; Sewell, 1929, p. 183.
Scottocalanus thorii, With, 1915, p. 215, text-figs. 68–70, pl. vi, figs. 14, *a–c*, pl. viii, figs. 14, *a*, *b*.

OCCURRENCE.—Sta. 145 D, Maldive Archipelago, 300–0 m. vertical, 1 male.

REMARKS.—Considerable confusion has arisen regarding this species. In a previous paper I have pointed out that in my opinion this species is synonymous with *Scottocalanus thorii* With, which is identical with the form recorded by Farran from the Irish coast, but is different from *S. persecans* (Giesbrecht), and that Sars is in error in regarding *S. persecans* and *S. thorii* as synonyms.

DISTRIBUTION.—In the Atlantic Ocean from the Iceland-Faroe Channel, the South of Iceland and Denmark Strait (With), the coast of Ireland and the Bay of Biscay (Farran), and the Gulf of Guinea (T. Scott). In the Indian Ocean from the Laccadive Sea (Sewell) and the Maldive region (present record). In the Pacific Ocean from the Malay Archipelago (A. Scott).

Scottocalanus persecans (Giesbrecht).

Scolecithrix persecans, Giesbrecht, 1895, p. 253, pl. iii, figs. 6–12; Esterly, 1905, p. 166, fig. 28 *a–e*.
Scottocalanus persecans, A. Scott, 1909, p. 105, pl. xxvii, figs. 10–18; Sars, 1925, p. 167, pl. xliv; Wilson, 1932, p. 80, fig. 55 *a–c*.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female, 1 male.

DISTRIBUTION.—In the Atlantic Ocean from the Woods Hole region (Wilson), the Gulf of Maine (Bigelow), the North Atlantic (van Breemen, Sars) and the South Atlantic (Wolfenden). In the Indian Ocean from the east of Cape Colony (Cleve) and the Arabian Sea (present record). In the Pacific Ocean from the Malay Archipelago (A Scott), the North Pacific Ocean (Giesbrecht), and the San Diego region of the coast of California (Esterly).

Scottocalanus securifrons (T. Scott).

Scolecithrix securifrons (♀ only), T. Scott, 1894, p. 47, pl. iv, figs. 41, 43–47, 49–52, 54, 56, and pl. v, fig. 1.
Lophothrix securifrons, Wolfenden, 1904, p. 120, pl. ix, figs. 12–15.
Scottocalanus securifrons, A. Scott, 1909, p. 104, pl. xxv, figs. 1–9, pl. xxviii, figs. 1–9; With, 1915, p. 220, text-figs. 71–73, pl. viii, figs. 13 *a*, *b*; Sars, 1925, p. 160, pl. xlv, figs. 1–8.

OCCURRENCE:

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 2 females, 2 males.
Sta. 172, Central part of Arabian Sea, 400–0 m., 18 females, 11 males; 850–0 m., 1 female.

DISTRIBUTION.—In the Atlantic Ocean from the Faroe Channel (Wolfenden), the Faroe-Iceland Channel (With), the west coast of Ireland (Farran, who states that it is very characteristic), the Bay of Biscay (Canu), the North Atlantic (Sars, Wolfenden, Rose), the Gulf of Guinea (T. Scott), and in the South Atlantic (Wolfenden). In the Indian Ocean off the east of Cape Colony (Cleve) and in the Arabian Sea (present records). In the Pacific Ocean from the Malay Archipelago (A. Scott), and Suruga Bay, Japan (Tanaka).

Genus *Scaphocalanus* Sars.

Scaphocalanus magnus (T. Scott).

Amallophora magna, T. Scott, 1894, p. 55, pl. iv, figs. 5–9; Sars, 1901–03, p. 51, pl. xxxiv, xxxv.
Scolecithrix cristata, Giesbrecht, 1895, p. 252, pl. ii, figs. 6–9, pl. iii, figs. 1–5.
Scaphocalanus acrocephalus, Sars, 1900, p. 36, pls. vii–ix.
Scaphocalanus magnus, With, 1915, p. 189, pl. vii, figs. 8, *a–d*, pl. viii, figs. 6, *a–g*, text-fig. 58 *a–k*.

OCCURRENCE:

Sta. 76, Gulf of Oman, 1500–0 m., 1 female (f. *minor*).
Sta. 96, central area of Arabian Sea, 645–400 m., 5 females and 1 male (juv.) (f. *major*).
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 2 females (f. *major*).
Sta. 172, Central area of Arabian Sea, 400–0 m., 1 female (f. *minor*); 850–0 m., 10 females (f. *minor*).

DESCRIPTIVE NOTES.—The specimens taken at Stas. 96 and 131 D appear to agree exactly with the descriptions and figures of this species given by previous authors, but the specimens from Stas. 76 and 172 are markedly smaller. Wolfenden (1911, p. 262) has called attention to the fact that specimens from the southern Atlantic, and especially from the Antarctic region, are smaller than those from the North Atlantic.

forma *major*. (Text-fig. 35, A–I.)

♀. Total length, 4·967 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 to 24. The proportional lengths of the various segments of the body are given below (*vide* p. 146).

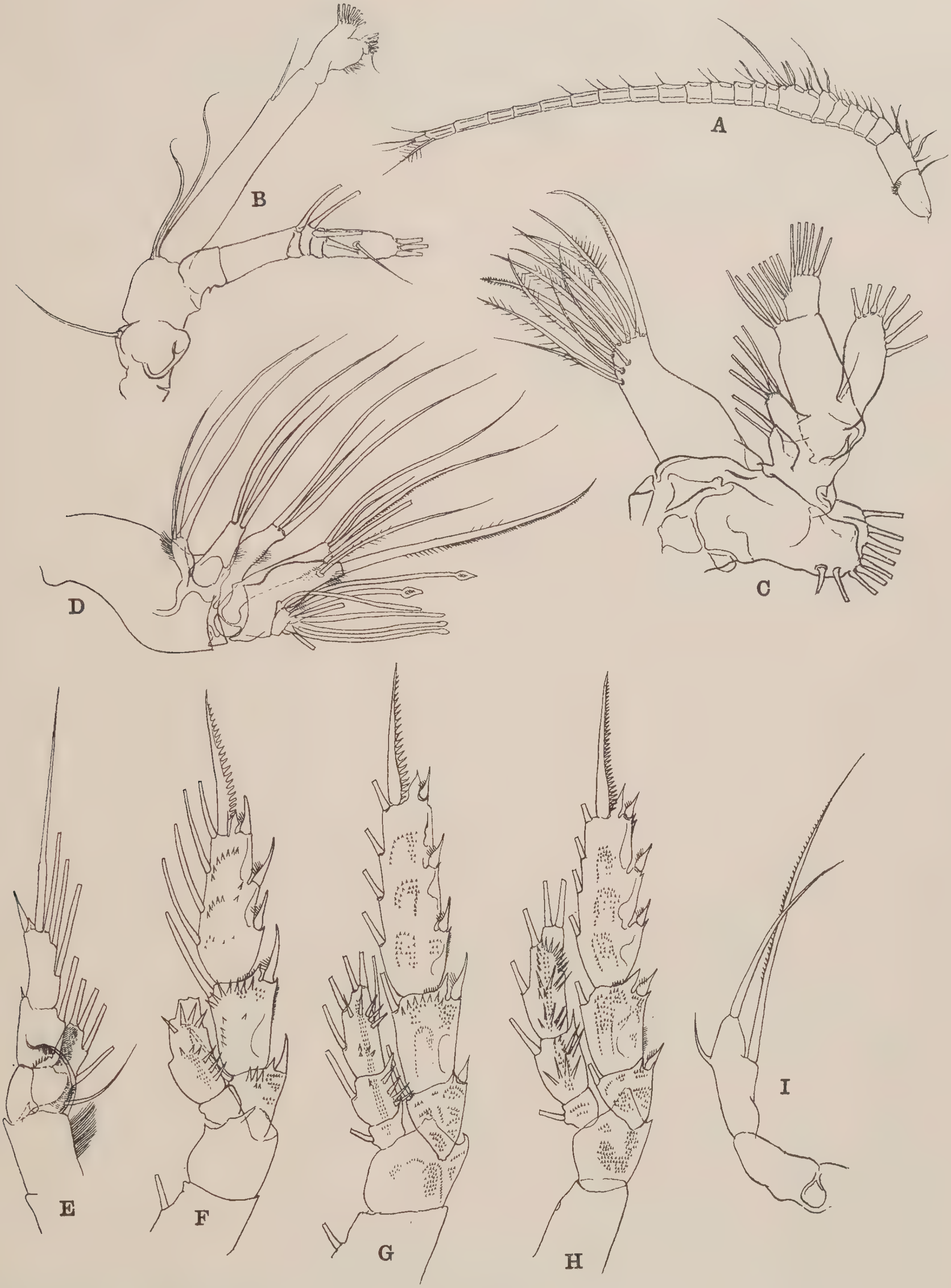
The head is somewhat bluntly rounded and is provided with a linear crest. The posterior thoracic margin is produced backwards in a wing, the apex of which is still further produced in a narrow rounded prominence, as figured by With (1915, text-fig. 58, *g*).

The proportional lengths of the segments of the 1st antenna (Text-fig. 35, A) are given below, and for convenience of reference I have also given the proportional lengths in f. *minor*:

Segment	1.	2.	3.	4.	5.	6.	7.	8–10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24–25.	
f. *major*	82	84	31	28	29	28	25	69	21	25	36	37	39	48	50	50	48	48	50	50	60	62	= 1000
f. *minor*	89	88	29	29	29	29	27	78	25	27	36	38	41	45	47	49	45	44	44	47	56	58	= 1000

The 1st segment bears a transverse row of delicate spinules near the distal margin.

The proximal segments, from 3 to 14 or 15, are slightly dilated, when viewed from the side and appear to be flattened laterally; the chitin is thickened along both anterior and posterior borders; from segment 16 to the end the chitin appears to be thickened along lines running parallel to the margins.



TEXT-FIG. 35.—*Scaphocalanus magnus* (T. Scott), f. *major*, ♀. A, 1st antenna. B, 2nd antenna. C, 1st maxilla. D, 2nd maxilla. E, 1st leg. F, 2nd leg. G, 3rd leg. H, 4th leg. I, 5th leg.

The 2nd antennæ (Text-fig. 35, B) and mouth parts (Text-fig. 35, C, D) agree with the descriptions and figures given by previous authors.

In the swimming legs (Text-fig. 35, E–H) 2, 3 and 4, in addition to the groups of large spinules on the posterior aspect of the several segments of the rami, there are patches of very small spinules on the anterior aspect of the limbs, and also on the 2nd basal segment in the 3rd and 4th legs.

The 5th leg (Text-fig. 35, I) agrees with the description of previous authors.

forma *minor*. (Text-fig. 36, A–H.)

♀. Total length, 3·550 mm.

The proportional lengths of the anterior and posterior regions of the body are as 76 to 24. The proportional lengths of the various segments of the body are given below. The forehead is more sharply rounded than in f. *major*. The posterior thoracic margin is produced backwards in a triangular, sharply rounded wing without any trace of the small projection at the apex.

The proportional lengths of the various segments of the 1st antenna (Text-fig. 36, A) have been given above, and differ only slightly from the corresponding lengths in f. *major*; the general characters of the appendage are identical in both forms.

The 2nd antenna (Text-fig. 36, B), mandible and 1st maxilla appear to be identical with the corresponding appendage in f. *major*.

The 2nd maxilla (Text-fig. 36, C) differs from that of f. *major* in that the posterior margin of the basal segment is produced backwards in a sharply rounded prominence. In this respect the shape of this appendage in these two forms agrees exactly with the difference that I have in a previous paper (Sewell, 1929, p. 125, text-fig. 71 *d*, and p. 197, text-fig. 72 *d*) noted in the two forms, *major* and *minor*, of *Lophothrix frontalis* Giesbrecht.

In the swimming legs (Text-fig. 36, D–G) there are again differences between the two forms in that in the present f. *minor* the groups of minute spinules on the anterior aspect of the rami of legs 2, 3 and 4 and on the 2nd basal segment of legs 3 and 4 are almost completely absent.

The 5th leg (Text-fig. 36, H) closely resembles that of f. *major*; in one specimen the outer marginal spine of the distal segment was wanting on one side.

REMARKS.—There appear to be slight, but quite appreciable, differences between these two forms in both the proportions of the body segments and also in the proportional lengths of the segments of the 1st antenna.

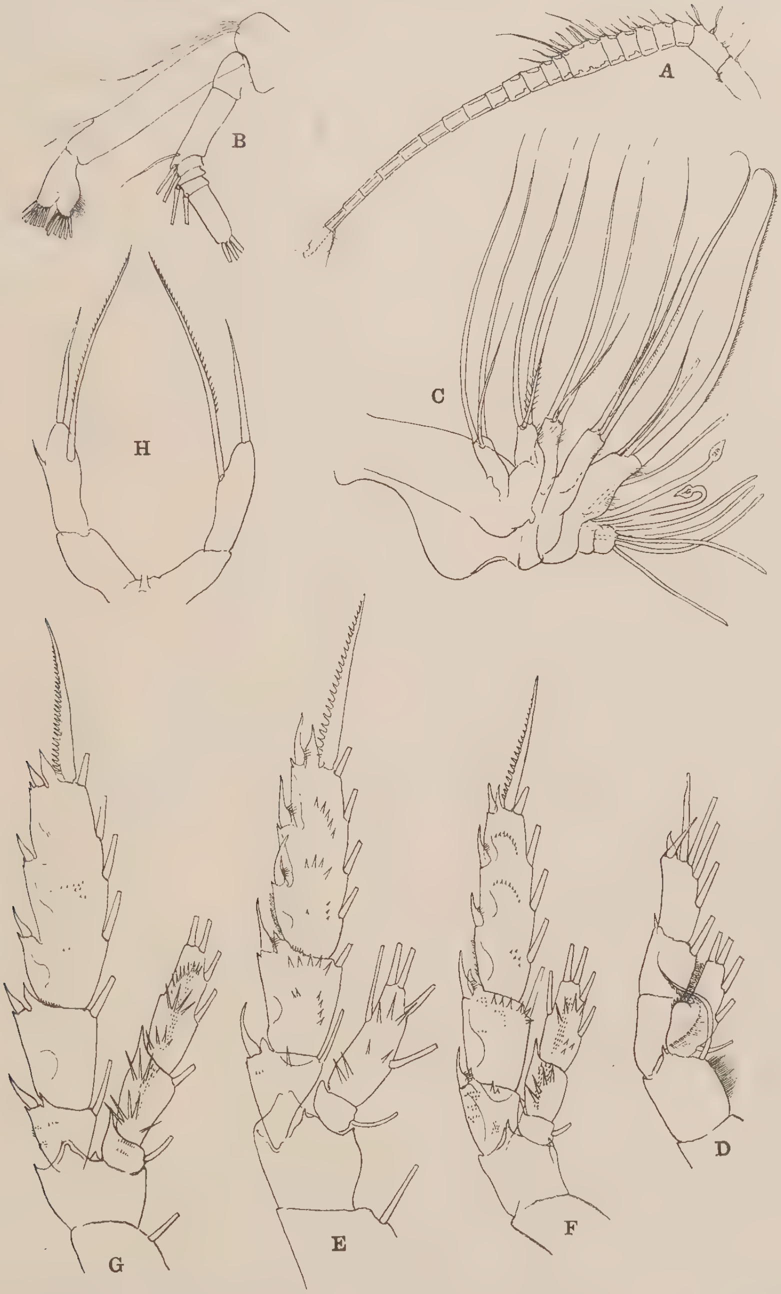
As regards the segments of the body, I give below the proportional lengths of the two forms:

	Cephalon. Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
f. *minor*	526	79	66	75	84	61	51	21	37
f. *major*	507	91	65	78	81	71	53	19	35

There thus seems to be a definite reduction in the proportional length of the fused cephalon-thoracic segment 1 as we pass from the smaller to the larger form, and this is to some extent compensated by an increase in the proportional length of thoracic segment 2. On the other hand, at the posterior end of the body there is a small reduction in the lengths of the anal segment and the furcal rami.

DISTRIBUTION.—This species, in one form or another, has a world-wide distribution.

In the Arctic Ocean (Duc d'Orleans). In the Atlantic Ocean from Denmark Strait, Iceland (With), off Greenland (Damas and Koefoed), the Woods Hole region (Wilson), the Gulf of Maine (Bigelow), the coast of Norway (Sars), the west coast of Ireland (Farran), the Bay of Biscay (Farran), the North Atlantic (Sars), the Gulf of Guinea (T. Scott), th South Atlantic and the Antarctic Ocean (Wolfenden). In the Indian Ocean from the Arabian Sea and Gulf of Oman (present records), the Laccadive Sea and Bay of Bengal (Sewell). In the Pacific Ocean from the Malay Archipelago (A. Scott), the north Pacific Ocean (Giesbrecht), and the San Diego region of the coast of California (Esterly).



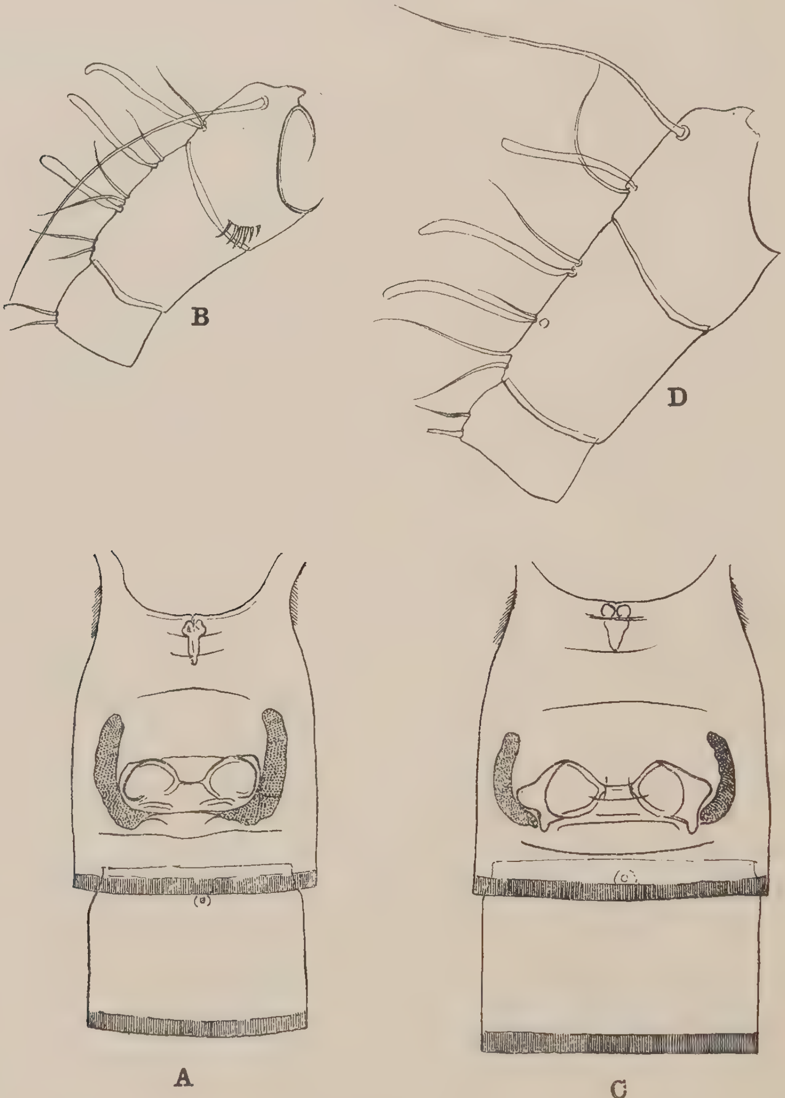
Text-fig. 36.—*Scaphocalanus magnus* (T. Scott), f. *minor*. A, 1st antenna. B, 2nd antenna. C. 2nd maxilla. D, 1st leg. E, 2nd leg. F, 3rd leg. G, 4th leg. H, 5th pair of legs.

Genus Lophothrix Giesbrecht.

Lophothrix, Giesbrecht, 1895, p. 254.

Lophothrix frontalis Giesbrecht. (Text-figs. 37, A–D; 38, A–F.)

Lophothrix frontalis, Giesbrecht, 1895, p. 254, pl. ii, figs. 1–5 and 9–12; A. Scott, 1909, p. 99, pl. xxvi, figs. 11–20 (♀), and pl. xxix, figs. 1–10 (♂); With, 1915, p. 211, figs. 66, 67 and pl. vii, fig. 7; Sars, 1925, p. 162, pl. xlv, figs. 9–21, and pl. xlvi, figs. 1–7; Sewell, 1929, p. 193, text-figs. 70–73.



Text-fig. 37.—*Lophothrix frontalis* Giesbrecht, ♀. A, f. *minor*, genital segment, ventral view. B, f. *minor*, proximal segments of 1st antenna. C, f. *major*, genital segment, ventral view. D, f. *major*, proximal segments of 1st antenna.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 4 females, 3 males (juv.).
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 2 females.
Sta. 145 D, Maldive area, 500–0 m., 1 female (juv.).

Sta. 172, Central part of Arabian Sea, 850–0 m., 10 females, 1 male, adult; 2 males (juv.).

Sta. 186, Gulf of Aden, 600–0 m., 2 females.

Remarks.—I have in a previous paper (Sewell, 1929) called attention to the occurrence in this species of two size groups. Examples of both groups were obtained in the present collection.

f. *minor*.

♀. The majority of the specimens belong to this group, but it is interesting to note that there appears to be a slight difference in the average size of specimens from different regions or possibly from different depths; the examples taken in the central part of the Arabian Sea, Sta. 96, 645–400 m. depth, and from the Gulf of Aden, Sta. 186, 600–0 m. depth, exhibited a total length that ranged from 5·033 to 5·300 mm., with an average of 5·143 mm., whereas those from the central area of the Arabian Sea, Sta. 172, 850–0 m. depth, exhibited a total length that ranged from 4·750 to 5·633 mm., with an average of 5·254 mm. The proportional lengths of the anterior and posterior regions of the body are as 82 to 18.

f. *major*.

♀. Two examples of this form were taken, one at Sta. 96, 645–400 m. depth, and the other at Sta. 131, 1500–0 m. depth; of these two the former measured 6·250 mm. and the latter 6·718 mm., the average of the two being 6·484 mm. Here again it seems probable that the larger specimen came from a greater depth than the smaller. The proportional lengths of the anterior and posterior regions of the body are as 81 to 19.

Apart from size the only valid difference between these two forms that I have been able to discover is the presence in f. *minor* of a row of spines on the ventro-posterior surface of the 1st segment of the 1st antenna near the distal margin: no such row has been detected in f. *major* (*cf.* Text-fig. 37, B and D).

♂. Total length, 4·5 mm.

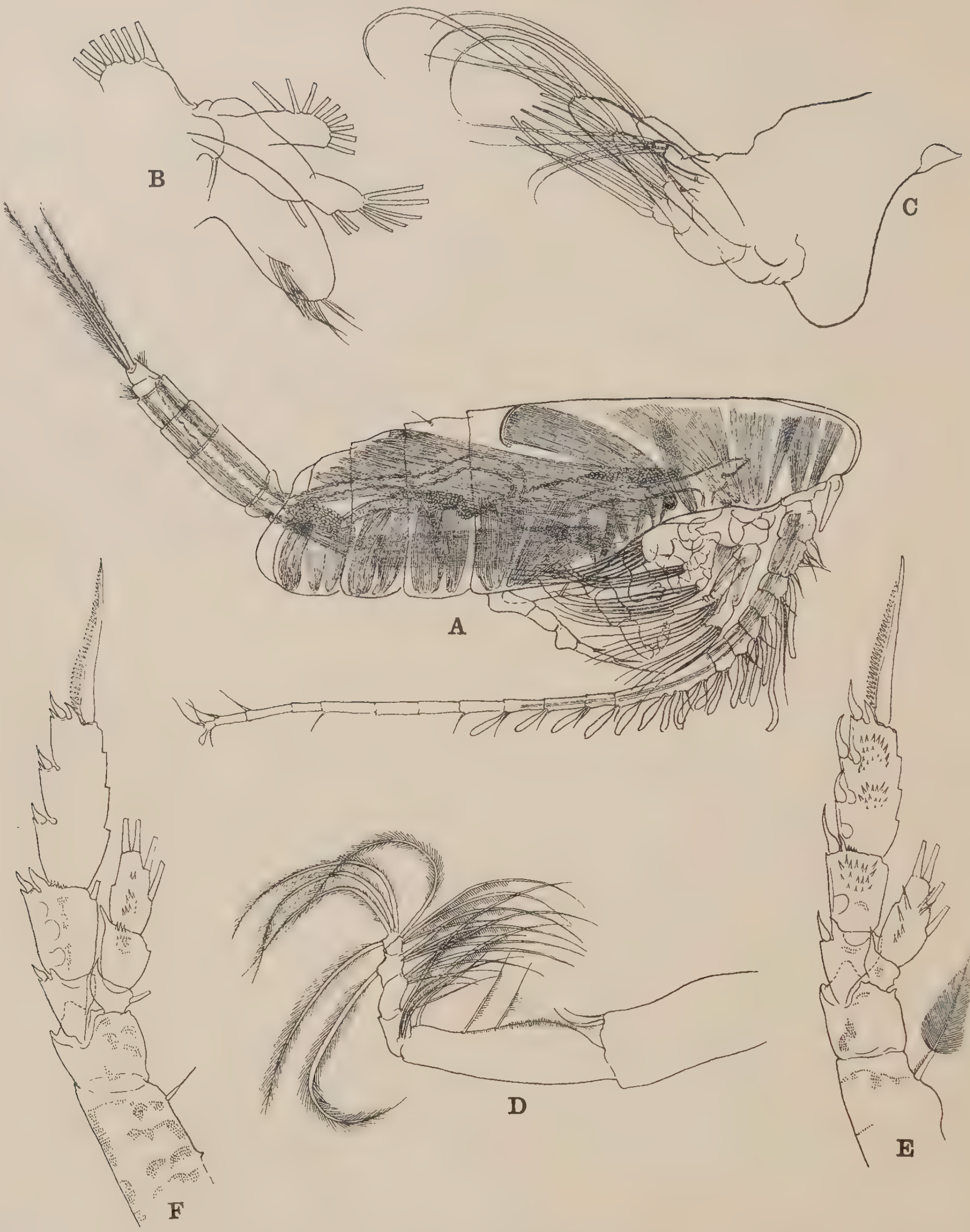
A. Scott gives the length of his specimens from the Malay Archipelago as 5·75 mm.

The proportional lengths of the anterior and posterior regions of the body are as 74 to 26. The proportional lengths of the various segments are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
510	82	63	46	39	28	79	57	57	9		30 = 1000

In its general characters the body agrees with A. Scott's description and figures.

In this sex (Text-fig. 38, A) the muscular development of the cephalothoracic region is far more powerful than in the female; this is notably the case in the musculature of the mouth-parts and especially of the mandible. In order to provide attachment for the posterior muscle an "apodeme" has been developed on the inner aspect of the dorsal surface, a little in front of the hinge-joint between the 1st and 2nd thoracic segments; probably this infolding of the chitin is situated along the line of fusion of the cephalon and 1st thoracic segment. This increase in the musculature of the mouth-parts is all the more peculiar in view of the fact that in the male the mouthparts are to some extent degenerate.



TEXT-FIG. 38.—*Lophothrix frontalis* Giesbrecht, ♂. A, Lateral view. B, 1st maxilla. C, 2nd maxilla. D, Maxilliped. E, 2nd leg. F, 4th leg.

The 1st antenna reaches back to the posterior border of the 1st abdominal segment. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–12.	13.	14.	15.	16.	17.	18.	19.	20–21.	22.	23.	24.	25.	
Right	58	48	23	23	25	23	24	194		46	52	58	63	63	59	77	35	57	52	20	= 1000
Left	58	48	23	23	25	23	24	148	47	49	51	58	62	62	59	77	33	58	52	20	= 1000

In both antennules the 8th to 13th segments are fused, but in the left appendage a trace of the fusion of the 12th and 13th segments can be clearly seen : segments 14 and 15 are also partly fused ; segments 20 and 21 are completely fused and segments 24 and 25 partly so.

In the 2nd antenna the setæ of the row on the inner margin of the 1st basal segment are much stronger than in the female.

According to A. Scott (1909, p. 100) " the antennæ, mandibles, maxillæ and maxillipeds are nearly similar to those of the female and are only slightly modified." Unfortunately, with the exception of the terminal portion of the 2nd maxilla (1st maxilliped) he does not figure these appendages.

The mandibular palp closely resembles that of the female, but I was not successful in removing the biting ramus and so am unable to compare it with that of the female.

The 1st maxilla (Text-fig. 38, B) is less strongly developed, and there is a quite marked reduction in the number of setæ on the various lobes.

	Female.	Male.
Li. 1 . .	13	? ; the setæ are slender and delicate.
Li. 2 . .	2	?
Li. 3 . .	4	1 or 2
Basal 2 . .	5	1
Endopod .	3, 5	2, 5
Exopod .	9	9
Le. 1 . .	9	9

In the 2nd maxilla (Text-fig. 38, C) there is a general resemblance to the female, but here too the setæ are reduced in number and are much less developed. The number of setæ arising from the various lobes is as follows :

	Female.	Male.
Lobe 1 . . .	4 + 1 very small.	2
,, 2 . . .	3	2
,, 3 . . .	3	2
,, 4 . . .	3	2 + 1 small.
,, 5 . . .	3	2 + 1 small.

The terminal portion bears 8 setæ that are modified, but I was unable to convince myself that any of these possessed flame-like endings such as are found in the female.

In the maxilliped (Text-fig. 38, D) the general shape agrees with that of the female, but the 1st basal segment bears only 2 setæ at the distal end and none on the proximal portion of the segment, and the 2nd basal segment has 3 setæ on the upper margin and 2 at the distal end as in the female. The external setæ on segments 4 and 5 of the endopod are markedly enlarged and recurved.

The swimming legs (Text-fig. 38, E, F) resemble those of the female.

DISTRIBUTION.—In the Atlantic Ocean this species has now been recorded from the deep waters of the Faroe Channel (T. Scott), off the south-west of Iceland (With) and the west coast of Greenland (Jespersen), the north-west part of the North Atlantic (Rose, Murray and Hjort), the west coast of Ireland and the Bay of Biscay (Farran), the temperate region of the North Atlantic (Sars, Rose) and in the South Atlantic (Wolfenden). In the Indian Ocean it has been recorded from the central and southern areas of the Arabian Sea (present record), the Maldive region (present record) and the Bay of Bengal (Sewell). In the Pacific it has been taken in the Malay Archipelago (A. Scott), in the San Diego region of the Californian coast (Esterly), and off the west coast of America (Giesbrecht).

It is a deep water species, and its depth destribution would appear to range from about 400 to 2000 metres.

Lophothrix humilifrons Sars. (Text-fig. 39, A.)

Lophothrix humilifrons, Sars, 1925, p. 166, pl. xlvi, figs. 15–22.

Occurrence.—Sta. 61 A, Gulf of Oman, 1500–0 m., 1 female.

Remarks.—♀. This single specimen, an adult, agrees extremely closely with the description given by Sars.

The total length is 5·913 mm., which is slightly smaller than Sars' examples. The proportional lengths of the cephalothorax and abdomen are as 77 to 22, and, according to Sars, the abdomen is a little more than a quarter the length of the cephalothorax.

The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
350	186	106	80	35	20	95	44	34	24	26 = 1000

The cephalon and 1st thoracic segment are almost completely fused, but a faint line of fusion can be traced across the dorsal region. Similarly the 4th and 5th thoracic segments are almost completely fused, only a faint line indicating their respective limits. The genital segment is very nearly equal in length to the three following segments together. The furcal rami are as broad as long and are hairy on their inner aspects.

The 1st antenna reaches back to the anal segment. The various segments have the following proportional lengths :

Segment 1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
64	64	28	28	28	28	28	64	31	34	38	45	52	48	48	52	52	48	39	39	34	39	48	21 = 1000

The 2nd antenna, mouth parts and swimming legs appear to be extremely similar to those of *Lophothrix frontalis*.

The genital aperture, however, presents certain differences, as will be seen from a comparison of Text-figs. 37, A, C, and 39, A.

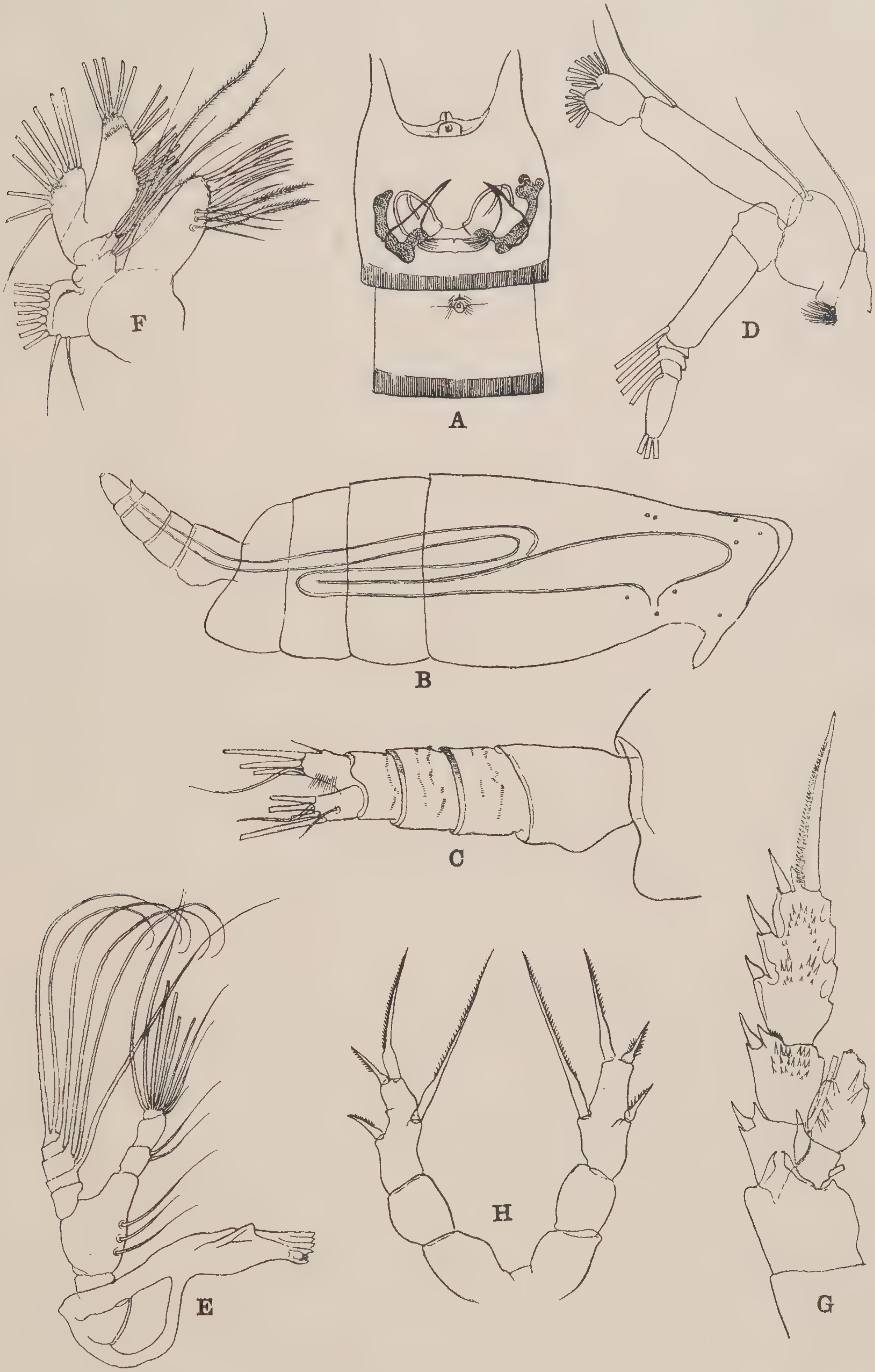
Distribution.—This species has hitherto been known only from West Greenland (Jespersen) and the Azores (Sars) in the North Atlantic. The present record extends its range to the Gulf of Oman.

Lophothrix quadrispinosa Wolfenden. (Text-fig. 39, B–H.)

Lophothrix quadrispinosa, Wolfenden, 1911, p. 269, pl. xxxiv, fig. 3 ; Sewell, 1929, p. 200, text-fig. 74, *a–f*.

Occurrence.—Sta. 172, Central area of Arabian Sea, 850–0. m., 4 females.

Descriptive Notes.—Total length, 5·483 mm.



Text-fig. 39.—*Lophothrix humilifrons* Sars, ♀. A, Genital segment, ventral view. *Lophothrix quadrispinosa* Wolfenden, ♀. B, Lateral view. C, Abdomen, dorso-lateral aspect. D, 2nd antenna. E, Mandible. F, 1st maxilla. G, 2nd leg. H, 5th pair of legs.

The proportional lengths of the anterior and posterior regions of the body are as 82 to 18. The proportional lengths of the various segments of the body are as follows :

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
553	98	76	76	78	38	30	21	30 = 1000

A few scattered pores are present in the chitinous covering of the head region. With (1915, p. 212) has called attention to the manner in which the alimentary canal of *Lophothrix frontalis* is flexed : he remarks, " the intestinal tract is curiously twisted. In front of the œsophagus a short cæcal sac is observed ; behind the stomach is gradually attenuated and forms a slight ventral convexity. At the insertion of the third pair of legs the intestine is suddenly, in a sharp bend, turned upwards and directed forwards, being thus placed dorsally to the mentioned part : somewhat in front of the maxillipeds it is continued through a second curvature into the intestine proper." The same condition is present in the present species (Text-fig. 39, B).

The three posterior segments of the abdomen (Text-fig. 39, C) are ornamented on their dorsal and dorso-lateral aspects with rows of fine hair-like spines, very similar to the ornamentation already recorded in *Lophothrix frontalis* (*vide* Sewell, 1929, p. 197).

In the present specimens the terminal segment of the 5th leg (Text-fig. 39, H) is very considerably longer than is shown by Wolfenden (*loc. cit.*, pl. xxxiv, fig. 3), and than in the specimens taken by me previously in the Bay of Bengal (Sewell, 1929, text-fig. 74, *e*). It is very much longer than the 2nd segment, and the portion distal to the 1st inner and outer spines is as long as the proximal part of the segment. The proportional lengths of the four spines also present differences in that the two outer spines are very considerably shorter than the terminal or the inner spines : in this respect these specimens approach more nearly to the condition present in *Lophothrix similis* Wolfenden.

DISTRIBUTION.—Previously recorded from the South Atlantic Ocean (Wolfenden) and the Bay of Bengal (Sewell). The present record, the Arabian Sea, partially bridges the gap between the two earlier records.

Genus *Amallothrix* Sars.

Amallothrix, Sars, 1925, p. 176.

Throughout the genus there appears to be a gradual reduction in the number of setæ that spring from the various parts of the 1st maxilla in the female : in a previous paper (Sewell, 1929, p. 221) I have called attention to this in three species, and in the table below I have added two others :

1st maxilla.	*validus.*	*gracilis.*	*emarginata.*	*arcuata.*	*indica.*
Le. . . .	9	—	9	9	7
Li. 1 . .	12	12	12	11	10
Li. 2 . .	2	2	2	2	2
Li. 3 . .	4	4	4	3	3
Basal 2 . .	5	5	4	4	4
Endopod . .	8	8	7	7	6
Exopod . .	9	9	9	9	8

In many of the species of the genus the basal segments of the 2nd–4th swimming legs are ornamented with a pattern composed of minute spinules, very similar to that found in *Lophothrix frontalis*, and on basal 2 in *Scaphocalanus magnus* f. *major*. The sole exception to this among the species that I have examined is *Amallothrix indica*, in which I have been unable to detect any such ornamentation.

Amallothrix arcuata Sars. (Text-figs. 40, A–E; 41, A–J.)

Amallothrix arcuata, Sars, 1925, p. 185, pl. li, figs. 14–21; Sewell, 1929, p. 217.

Occurrence.—Sta. 172, Central part of Arabian Sea, 850–0 m., 2 females, 1 male.

Descriptive Notes.—♀. Total length, 2·5 mm.

This is slightly smaller than Sars' examples from the North Atlantic, which measured 2·8 mm. in length.

The proportional lengths of the various segments of the body are as follows:

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
492	98	97	90	85	42	42	18	36 = 1000

The head and 1st thoracic segment are fused. The forehead is vaulted and broadly rounded. The 4th and 5th thoracic segments are fused and the posterior thoracic margin is rounded, but there is a slight emargination in the dorso-lateral region and just above this the margin is thickened. The genital segment of the abdomen is equal in length to the two following segments, and is slightly prominent ventrally.

The 1st antenna reaches back to about the 4th segment of the abdomen. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
	57	46	25	25	25	23	25	45	22	22	25	32	39	46	57	60	62	56

20.	21.	22.	23.	24–25.
52	55	52	69	80 = 1000

The 8th and 9th and the 24th and 25th segments respectively are fused. Segment 1 bears a transverse row of hairs on its posterior aspect near the distal border.

The 2nd antenna and mouth parts closely resemble those of other members of the genus. The exopod of the 2nd antenna is longer than the endopod, and this latter bears 8 setæ on the inner lobe and 7, one of which is very small, on the outer. The 1st segment of the exopod shows no trace of the small papilla that is present in *A. emarginata* and *A. indica*. The 1st basal segment carries a row of hairs on its inner aspect.

The mandible is similar to that of *A. emarginata*.

The 1st and 2nd maxillæ (Text-fig. 40, A) show no difference from those of other members of the genus; in the latter appendage the terminal segments bear several brush-like sensory organs, as well as two or more long cylindrical ones.

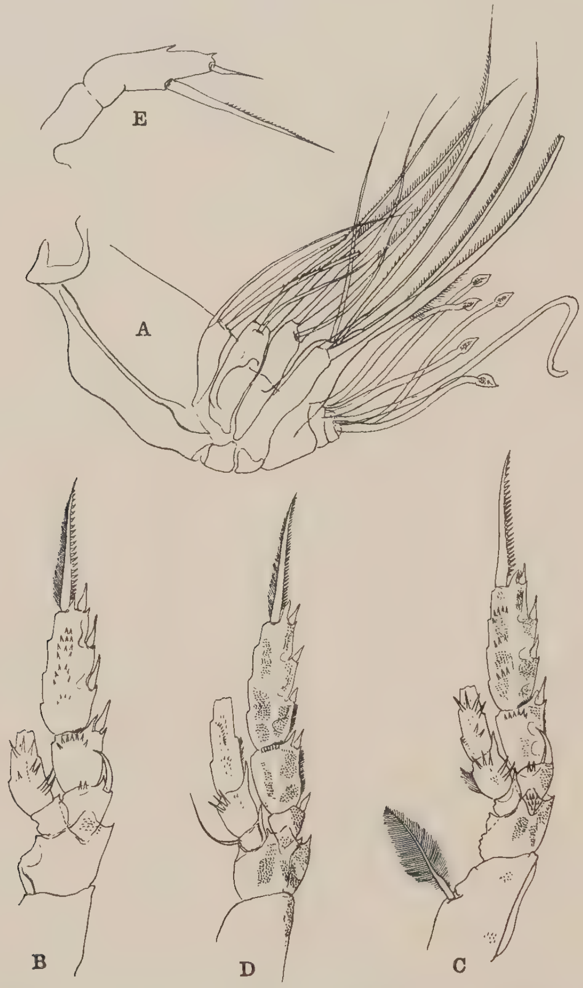
In the 1st leg the endopod consists of a single segment. Each of the three segments of the exopod bears a marginal spine.

In the 2nd and 3rd legs (Text-fig. 40, B, C) the 1st segment of the exopod is armed with a long curved marginal spine that closely resembles that of *A. falcifer* (Farran) and *A. valida* (Farran).

In the 3rd leg the 2nd basal segment bears near the articulation with the exopod a patch of medium-sized spines, similar to that in *A. gracilis* Sars.

The basal segments, especially the 2nd, and the segments of the exopod of the 3rd and 4th legs (Text-fig. 40, D, E) are richly ornamented with patches of minute scales, that appear to be rounded and resemble fish-scales. This ornamentation is on the anterior aspect of the limb, the stouter spines being borne on the posterior aspect.

The 5th leg (Text-fig. 40, E) agrees closely with the figure given by Sars.



TEXT-FIG. 40.—*Amallothrix arcuata* Sars, ♀. A, 2nd maxilla. B, 2nd leg. C, 3rd leg. D, 4th leg. E, 5th leg.

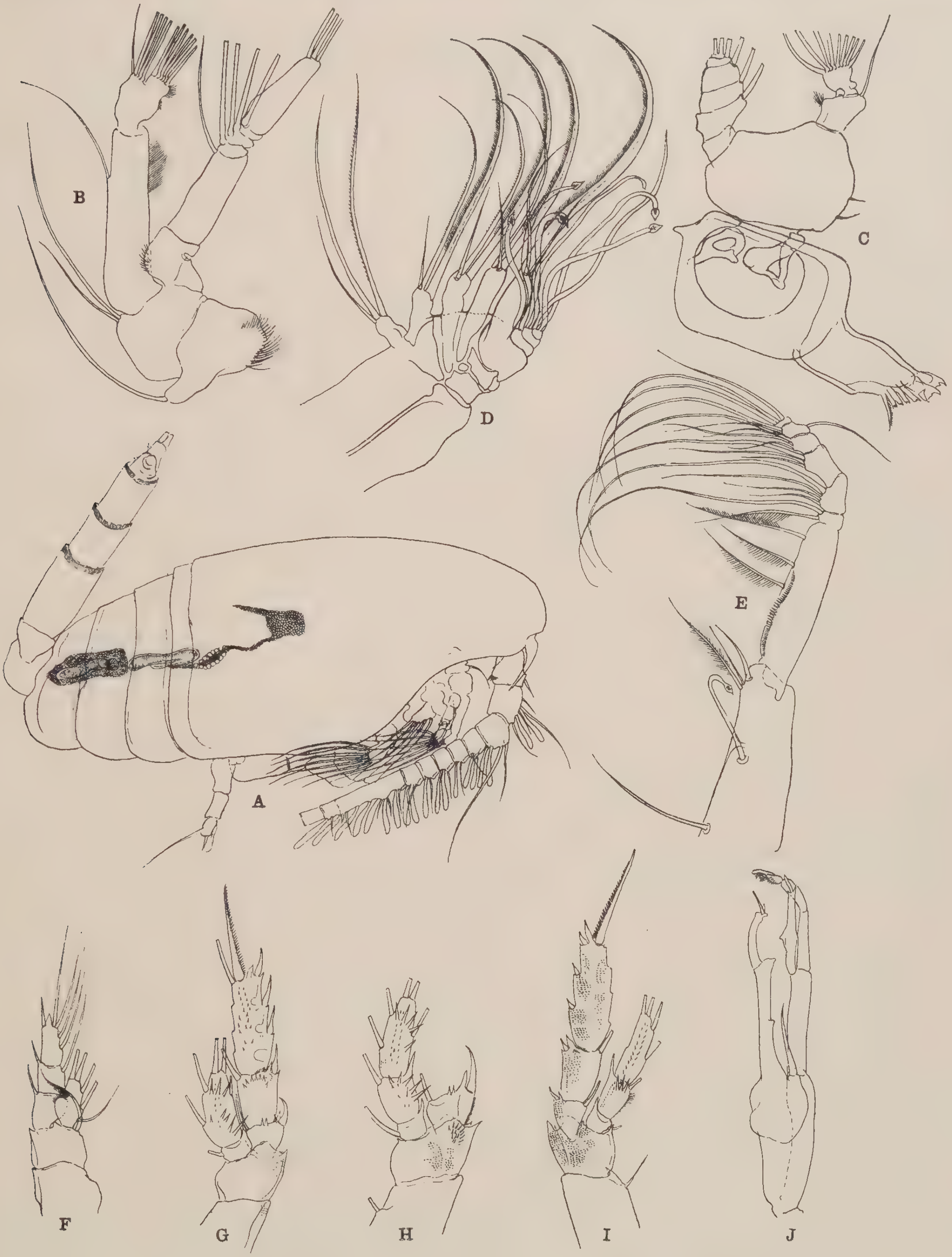
Associated with the 2 females was a single male, that seems to me to be the hitherto unknown male of this species.

♂. Total length, 3·0 mm.

The proportional lengths of the various segments of the body are as follows :

Cephalon and Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.	
512	54	54	54	38	120	65	65	16	22	= 1000

The forehead (Text-fig. 41, A) is vaulted and bluntly rounded, the rostrum is depressed. The cephalon and 1st thoracic segments are fused. Immediately in front of the posterior margin there is a line of thickening across the dorsal aspect that is continued down the lateral region but fades out before reaching the ventro-lateral margin; possibly this represents the line of fusion, but if so the 1st thoracic segment is very narrow in comparison



Text-fig. 41.—*Amallothrix arcuata* Sars, ♂. A, Lateral view. B, 2nd antenna. C, Mandible. D, 2nd maxilla. E, Maxilliped. F, 1st leg. G, 2nd leg. H, Basal segments, and endopod, 3rd leg. I, 4th leg. J, 5th pair of legs.

with the following segments. The 4th and 5th thoracic segments are fused and the posterior margin is rounded, but there is a very shallow emargination in the dorso-lateral region ; a fine line of fusion runs close to the posterior margin.

The 1st antenna is, unfortunately, broken off on both sides. The proximal segments are densely provided with sensory processes, as a rule 2 arising from each segment. Segments 9 to 13 are fused completely and the separation of 13 and 14 is incomplete.

In the 2nd antenna (Text-fig. 41, B) the exopod is considerably longer than the endopod, over-reaching it by the terminal segment ; segment 1 of the exopod is armed with scattered hair-like spinules. The 1st basal segment bears a row of hairs on its inner aspect.

The mandible (Text-fig. 41, C) is well developed, and it is of interest to note that between the basal part of the biting ramus and the inflated segment bearing the two rami there is a small but fully chitinized segment, which supports the contention that there are three segments in the basal part of this appendage.

The 1st maxilla appears to be identical with that of the female.

The 2nd maxilla (Text-fig. 41, D) is also very similar to that of the female.

The maxilliped (Text-fig. 41, E) is fully developed, and resembles that of the female.

The swimming legs (Text-fig. 41, F–I) show a close agreement with those of the female, even to the number and arrangement of the spinules on the various segments of the rami.

The 5th pair of legs (Text-fig. 41, J) possesses the same basic arrangement as in *Amallothrix obtusifrons* and *A. gracilis*, but differs from both these species in details of structure.

DISTRIBUTION.—This species has now been recorded from the North Atlantic (Sars) ; the Arabian Sea (present record) and the Laccadive Sea (Sewell).

Amallothrix emarginata (Farran). (Text-fig. 42, A–F.)

Scolecithrix emarginata, Farran, 1905, p. 36, pl. viii, figs. 6–17.
Scolecithricella obtusifrons, A. Scott, 1909, p. 92, pl. xxxi, figs. 1–9.
Scaphocalanus obtusifrons, With, 1915, p. 194, text-figs. 60, 61, pl. vii, figs. 9 *a–d*, pl. viii, figs. 8, *a–e*.
Amallothrix emarginata, Sars, 1925, p. 181, pl. l, figs. 17–23.
? *Scolecithrix inornata*, Esterly, 1906, p. 67, pl. ix, fig. 18, pl. xi, fig. 37, pl. xiii, figs. 65, 73.
? *Scolecithrix æqualis*, Wolfenden, 1911, p. 255, text-fig. 33, *a–c*.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

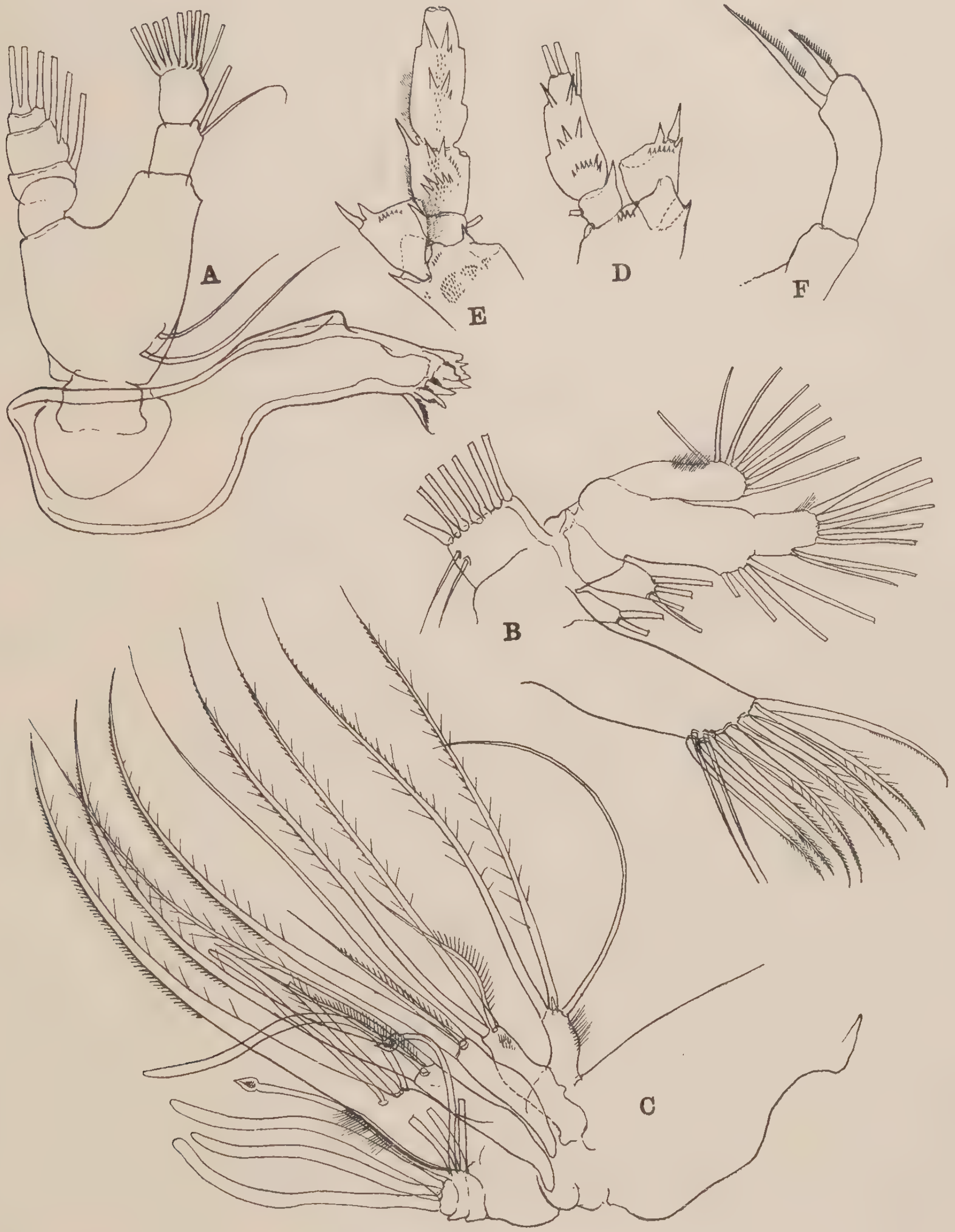
DESCRIPTIVE NOTES.—♀. Total length, 4·3 mm.

This agrees exactly with A. Scott's examples from the Malay Archipelago.

The proportional lengths of the anterior and posterior regions of the body are as 81 to 19. Wolfenden (1911, p. 255) gives the total length of the example that he named *Scolecithrix æqualis* as 3·65 mm., which is somewhat smaller than the present example, but he gives the proportional lengths of the two regions of the body as 2·95 and 0·7 mm., which agrees exactly with the proportions given above, namely, 81 to 19.

The body tapers somewhat anteriorly. The 5th thoracic segment is partially separated off from the 4th as a narrow strip along the posterior margin. The posterior margin when viewed from the side is emarginate : Wolfenden states that in *S. æqualis* the 4th and 5th segments are fused, and he figures them as being uniformly rounded postero-laterally.

In the abdomen the proportional lengths of the segments are as 38, 22, 22, 8, 10. In the 2nd and 3rd segments the proportions of length to breadth are as 5 to 7 and 5 to 6·5 respectively.



TEXT-FIG. 42.—*Amallothrix emarginata* (Farran), ♀. A, Mandible. B, 1st maxilla. C, 2nd maxilla. D, Basal region and endopod of 2nd leg. E, Basal region and endopod of 3rd leg. F, 5th leg.

The 1st antenna differs on the two sides. Wolfenden, in his account of *S. æqualis*, states that the appendage on the right side is composed of 23 segments, while that on the left has only 22; in the present specimen the opposite is the case, the right antennule possessing only 22 segments, while the left has 23. The proportional lengths of the segments are given below, and for the purpose of comparison I have given the lengths, as stated by Farran in his specimens, recalculated as parts per 1000.

Segment	1.	2.	3.	4.	5.	6.	7.	8–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
Present example	68	58	30	28	29	25	25	40	25	28	32	46	49	50	51	50	50	49	49	47	49	58	64		= 1000
From Farran	51	51	26	26	26	23	21	38	26	30	34	51	53	53	53	53	53	53	53	49	51	60	66		= 1000

Wolfenden gives the lengths of the last five segments in *æqualis* as 25, 24, 19, 20, 20 ; at first sight these figures exhibit marked differences from either Farran's account of *emarginata* or the present specimen ; but I believe that Wolfenden has given the lengths in the inverse order, commencing from the end segment, and, if so, the proportional lengths of these segments, as recalculated to the same scale as those given above, would read thus—

20.	21.	22.	23.	24–25.
49	49	47	59	62

The 1st segment bears a transverse row of hairs distally and parallel to the distal margin.

In the 2nd antenna the 1st basal segment bears a row of long hairs on its inner border : the proportional lengths of the rami agree with the accounts given by previous authors ; the 1st segment of the exopod is produced in a small rounded prominence on its anterior margin near the distal border.

The mandible (Text-fig. 42, A) is a powerful biting organ. With (1915, p. 194) states that this appendage is "scarcely different from those of *S. magnus*," but a comparison of the two shows that in the present form the two rami of the palp are of approximately equal length, whereas in *S. magnus* the endopod is only about half the length of the exopod.

In the 1st maxilla (Text-fig. 42, B) Farran figures only 7 large setæ arising from the 1st outer lobe ; With states that there are in his examples 7 long setæ and a shorter, more delicate one : in the present specimen there are two short, delicate setæ, in addition to the 7 large ones. The 1st inner lobe bears 12 setæ, that are slightly shorter than the lobe itself ; the 2nd inner lobe has 2 setæ and the 3rd inner lobe 4. The basal segment bears only 4 setæ, exopod 1 has 2 setæ, and endopod 2–3 bears 5. The exopod carries 8 setæ and the outer border is hairy.

The 2nd maxilla (Text-fig. 42, C) and maxilliped agree with the figures given by Farran, except that the 2nd basal segment of the maxilliped bears a sensory appendage, thus agreeing with With's specimen.

The swimming legs in the present specimen are badly damaged ; but sufficient remained to indicate that they agree closely with the description given by With. In addition to the minute spinules on the anterior face of the endopod of the 3rd leg, to which With has called attention, there are also patches of similar minute spinules on the 2nd basal segment (Text-fig. 42, E).

The 5th legs (Text-fig. 42, F) agree with the descriptions of previous authors.

Remarks.—With (1915, p. 197) has pointed out that "this species is nearly related to, if not identical with, Wolfenden's *S. æqualis* from the South Atlantic, as well as with *S. inornata* Esterly, but the descriptions are too insufficient for solving the question." The manner in which the above specimen agrees with Wolfenden's account of *S. æqualis*, especially in respect to the asymmetry of the 1st antenna, strengthens the belief that *æqualis* is a synonym of *emarginata*.

Distribution.—Assuming that *Scolecithrix inornata* Esterly and *S. æqualis* Wolfenden are synonyms of *Amallothrix emarginata* Farran, this species would appear to have a very wide distribution, ranging in the Atlantic Ocean from the Faroe-Iceland channel, off the south of Iceland, and Denmark Strait (With), to the west coast of Ireland (Farran, Pearson), the Woods Hole region (Wilson), the Gulf of Maine (Bigelow), the temperate North Atlantic (Sars, Lysholm and Nordgaard, Rose) and the tropical Atlantic region (Wolfenden). In the Indian Ocean from the Arabian Sea (present record) and the Laccadive Sea (Sewell). In the Pacific Ocean from the Malay Archipelago (A. Scott) and the San Diego region of the coast of California (Esterly).

Amallothrix gracilis Sars. (Text-fig. 43, A–F.)

Scolecithricella gracilis, Sars, 1905, p. 21.
Scolecithrix globiceps, Farran, 1906, p. 54, pl. v, figs. 8–13, pl. vi, fig. 8.
Amallothrix gracilis, Sars, 1925, p. 176, pl. xlix, figs. 9–21.
Scaphocalanus globiceps, With, 1915, p. 199, text-fig. 63, *a*, *b*; pl. vii, figs. 10, *a*, *b*; pl. viii, figs. 9, *a–c*.
? *Scolecithricella gracilis*, A. Scott, 1909, p. 93, pl. xxxi, figs. 8–13.

Occurrence.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

Remarks.—I have no hesitation in referring this specimen to Sars' species: I am, however, doubtful whether the form described by A. Scott (1909) from the Malay Archipelago is actually an example of this species, for in the 2nd leg (Text-fig. 43, C) he figures on the 2nd segment of the exopod a double row of spinules along the distal border, whereas in my example, and in other authors' descriptions and figures, only a single row is present in this situation. Again, in the 5th leg (Text-fig. 43, F) the small external marginal spine arises in Scott's example much nearer the proximal end of the segment, markedly proximal to the point of origin of the inner spine, whereas in the true *gracilis* the origins of these two spines are nearly opposite each other: and finally, the portion of the ramus that is distal to the origin of the inner spine appears to be much longer in Scott's specimen than in true examples of *A. gracilis*.

Distribution.—This species has now been recorded from the Arabian Sea (present record), the North Atlantic Ocean near the Azores and the coast of Portugal (Sars), the west coast of Ireland (Farran) and south of Iceland (With). If A. Scott is correct in his identification the species also occurs in the Malay Archipelago.

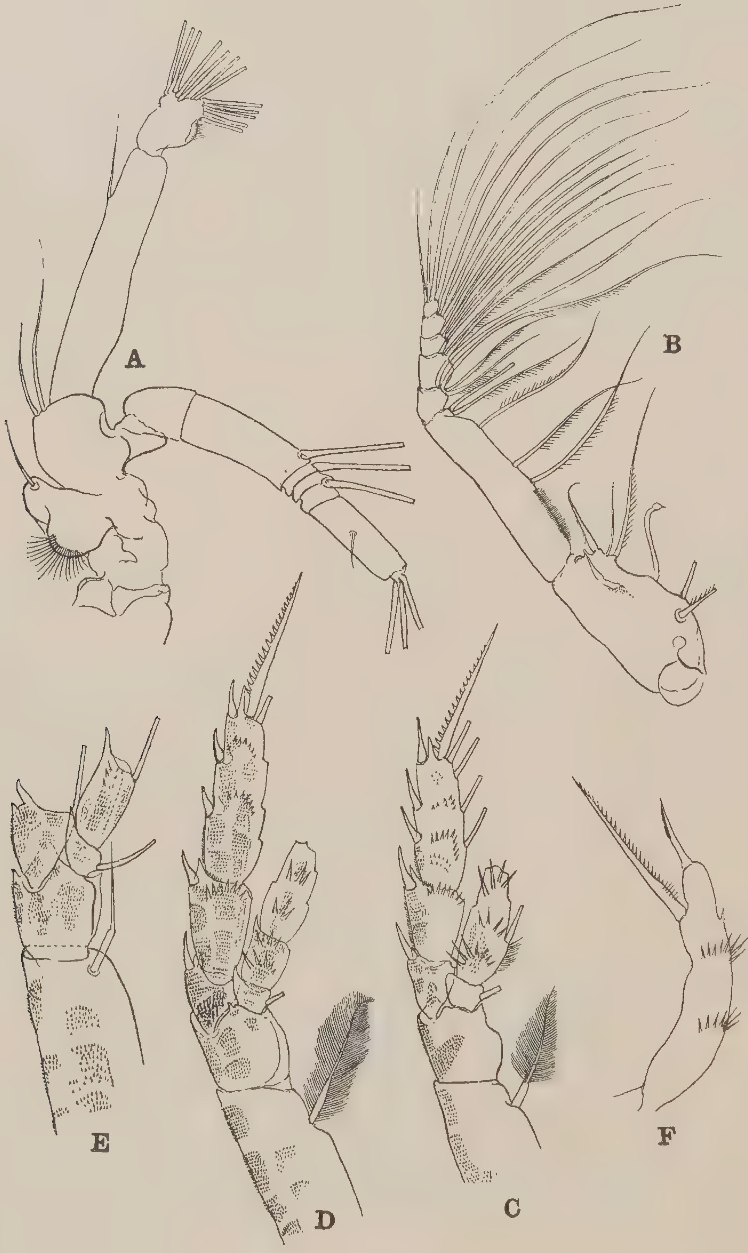
Amallothrix indica Sewell.

Amallothrix indica, Sewell, 1929, p. 219, text-fig. 81 *a–g*.

Occurrence:

Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 96, Central part of Arabian Sea, 645–400 m., 5 females.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

Remarks.—The total length of these specimens ranged from 3·233 to 3·40 mm. They are thus slightly larger than the specimens previously recorded by me from the Laccadive Sea.



Text-fig. 43.—*Amallothrix gracilis* Sars, ♀. A, 2nd antenna. B, Maxilliped. C, 2nd leg. D, 3rd leg. E, Proximal part of 4th leg. F, 5th leg.

Distribution.—This species has now been recorded from the Laccadive Sea (Sewell) and the central and northern parts of the Arabian Sea (present records).

Family Centropagidæ.

Genus *Centropages* Kröyer.

Centropages, Giesbrecht, 1892, p. 303.

Centropages calaninus (Dana).

Centropages calaninus, Giesbrecht, 1892, p. 305, pl. xvii, figs. 27, 28, 42; pl. xviii, fig. 11; pl. xxxviii, figs. 1, 21; Wolfenden, 1906, p. 1014, pl. xcviii, figs. 6, 15.

Occurrence.—Sta. 61, Northern area of Arabian Sea, surface, 1 male.

Distribution.—This species, though comparatively rare, is widely distributed throughout the Indo-Pacific region. It has been recorded from the Pacific Ocean (Dana, Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott), the Bay of Bengal (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott), the Maldive and Laccadive Archipelagoes (Thompson and A. Scott, Wolfenden), the Arabian Sea (Cleve, Thompson and A. Scott, present record), the Red Sea (A. Scott) and the South Atlantic Ocean, in 26° 50′ S. (T. Scott).

Centropages gracilis (Dana).

Centropages gracilis, Giesbrecht, 1892, p. 305, pl. xvii, figs. 31, 32, 46, pl. xxxviii, figs. 4, 13; Wolfenden, 1906, p. 1013, pl. xcviii, fig. 7.

Occurrence :

Sta. 61 A, Northern part of Arabian Sea, surface, numerous examples, 2000–0 m., 1 female, 1 male.
Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female.

Remarks.—The specimens, noted above, that were taken in the nets from deep hauls were almost certainly caught near the surface as the net was being hauled.

The dorsal region of the 1st–4th thoracic segments is ornamented by clumps of fine needle-like spinules.

Distribution.—In the Pacific Ocean on the east side (Dana), and on the west (Giesbrecht), on the Australian Barrier Reefs (Farran), and in the Malay Archipelago (A. Scott). In the Indian Ocean on the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), in the Laccadive Sea (Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present records), the Red Sea (Thompson and A. Scott), and in the South Atlantic Ocean in about lat. 28° S. (Wolfenden).

Centropages orsinii Giesbrecht.

Centropages orsinii, Giesbrecht, 1892, p. 305, pl. xvii, figs. 35, 36, 41, 42, pl. xviii, figs. 2, 14, 23, pl. xxxviii, figs. 12, 19; Wolfenden, 1906, p. 1015, pl. xcviii, figs. 1, 4, 5, 8, 11, 12, 13.

Occurrence.—Sta. 61, Northern part of Arabian Sea, surface, numerous specimens.

Distribution.—The Australian Barrier Reef (Farran), the Aru Archipelago (Früchtl), the Malay Archipelago (A. Scott), the coast of Burma (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Madras coast (Menon), the Maldive and Laccadive

Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, Pesta, present record), the Persian Gulf (Pesta), the Gulf of Aden (A. Scott), the Red Sea (Giesbrecht), Durban Bay (Brady).

Family PSEUDODIAPTOMIDÆ.

Genus *Schmackeria* Poppe and Richard.

Schmackeria, Poppe and Richard, 1890, p. 1; Marsh, 1933, p. 41.

Schmackeria serricaudatus (T. Scott).

Heterocalanus serricaudatus, T. Scott, 1894, p. 40, pl. ii, figs. 43–48; pl. iii, figs. 1–7.
Pseudodiaptomus serricaudatus, A. Scott, 1902, p. 404, pl. i, fig. 6.
Schmackeria serricaudatus, Marsh, 1933, p. 46, pl. xxii, figs. 2, 3.

OCCURRENCE:
Sta. 56, South Arabian Coast, surface, several examples.
Sta. 58, South Arabian Coast, surface, several examples.

DISTRIBUTION.—The Chilka Lake (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the west coast of India (Cleve), the Arabian Sea (Thompson and A. Scott), the South Arabian Coast (present records), the Gulf of Aden (Thompson and A. Scott), the Red Sea (A. Scott), south of Cape Colony (Cleve), and the Gulf of Guinea (T. Scott). It would thus appear to be an Indian Ocean form that has managed to get round the Cape of Good Hope into the Gulf of Guinea, where it was originally taken.

Genus *Pseudodiaptomus* Herrick.

Pseudodiaptomus, Herrick, 1884, p. 180; Marsh, 1933, p. 27.

Pseudodiaptomus salinus (Giesbrecht).

Schmackeria salina, Giesbrecht, 1896, p. 322, pl. vi, figs. 23–28.
Pseudodiaptomus salinus, Thompson and A. Scott, 1903, p. 248, pl. ii, figs. 21–23; Marsh, 1933, p. 39, pl. xx, figs. 4, 5.

OCCURRENCE.—Sta. 56, South Arabian Coast, surface, 1 male.

DISTRIBUTION.—The Nicobar Islands (Sewell), the Arabian coast (present record), the Red Sea, Gulf of Suez, and Suez Canal (Thompson and A. Scott, Gurney).

Family TEMORIDÆ.

Genus *Temora* Baird.

Temora, Giesbrecht, 1892, p. 329; Giesbrecht and Schmeil, 1898, p. 100.

Temora discaudata Giesbrecht.

Temora discaudata, Giesbrecht, 1892, p. 328, pl. xvii, figs. 3, 20, 23; pl. xxxviii, figs. 24, 25, 28; Sewell, 1912, p. 365, pl. xxii, figs. 8, 9.

OCCURRENCE.—Sta. 56, South Arabian Coast, surface, 5 males.

DISTRIBUTION.—Widely distributed throughout the Pacific and Indian Oceans and in the Mediterranean Sea. It has been reported from the whole width of the Pacific Ocean between lats. 9° S. and 20° N., and from New Holland, the Philippine Islands, Fiji and the Kei Islands (Giesbrecht), the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl), the Malay Archipelago (Cleve, A. Scott), the coast of Southern Burma and the Nicobar Islands (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Cleve), the coast of Southern Arabia (present record), the Persian Gulf (Pesta), the Gulf of Aden (Thompson and A. Scott), the Red Sea (Giesbrecht, Thompson, A. Scott), the Suez Canal (Gurney), the Mediterranean Sea (Thompson and A. Scott), and the Agulhas current east of Cape Colony (Cleve).

Temora turbinata (Dana).

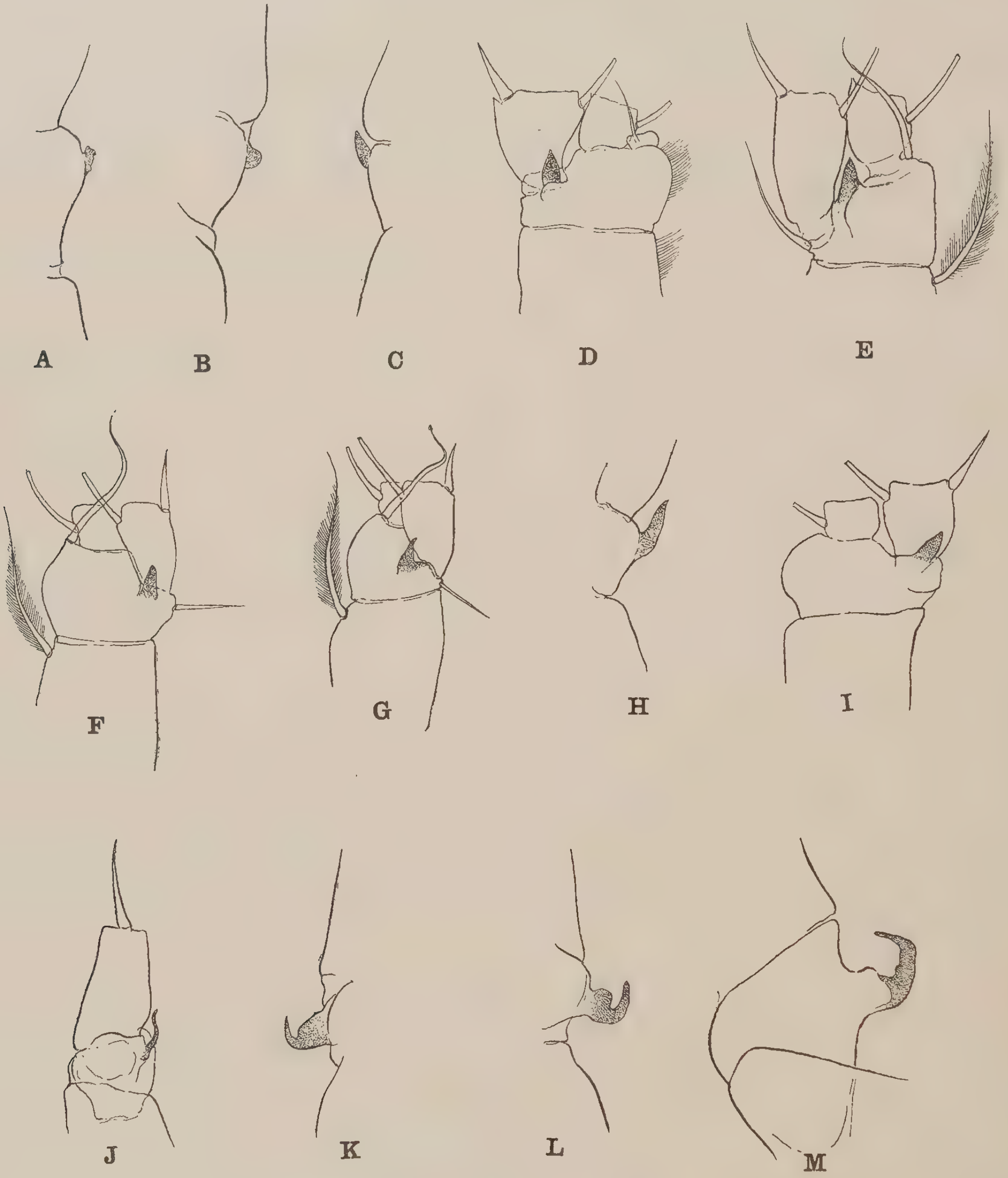
Temora turbinata, Giesbrecht, 1892, p. 329, pl. xvii, figs. 14, 17, 18, 21 ; pl. xxxviii, fig. 27 ; Wilson, 1932, p. 106, fig. 71, *a–c*.
Temora longicornis, T. Scott, 1894, p. 76, pl. ix, fig. 13.
Temora tenuicauda, Brady, 1899, p. 34, pl. ix, figs. 16–23.
Temora africana, Brady, 1914.

Occurrence.—Sta. 56, South Arabian Coast, surface, 3 females, 2 males.

Distribution.—Like the preceding species, this is widely distributed throughout the western part of the Pacific Ocean and throughout the Indian Ocean, and has spread into the Atlantic Ocean. It has been recorded from Hong Kong (Giesbrecht), the Sulu Sea (Dana), the coast of New Zealand (Brady, as *T. tenuicauda* ; Farran), the Australian Barrier Reefs (Farran), Aru Archipelago (Früchtl), the Malay Archipelago (Cleve), Kurau River, Penang (Sewell), the coast of Southern Burma (Sewell), the Madras Coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Arabian Sea (Pesta), the Persian Gulf (Pesta), the coast of South Arabia (present record), near Durban Bay, E. Africa (Brady, as *T. africana*), the Gulf of Guinea (T. Scott), the North Atlantic Ocean (T. Scott, Sars), the Gulf of Maine (Bigelow) and the Woods Hole region of North America (Wilson).

Family Metridiidæ.

In the Family Metridiidæ and the closely related Families Lucicutiidæ and Heterorhabdidæ we have a group of genera in which there is a marked degree of development of the cutaneous glands both on the appendages and on the segments of the body. Giesbrecht (1895) has called attention to these glands in the genera *Metridia*, *Lucicutia*, *Pleuromamma* and *Heterorhabdus*, and he has pointed out that some, at least, of these glands produce a luminescence. Similar enlarged glands are also to be seen in the genus *Gaussia* (*vide* Sewell, 1932, p. 271, fig. 92), *Hemirhabdus* (*loc. cit.*, p. 303, fig. 99), *Mesorhabdus* and *Disseta* (*loc. cit.*, p. 310, fig. 102), as well as in the genera *Arietellus* and *Phyllopus*. It is interesting to note that in all these genera there is on the posterior aspect of the 2nd basal segment of the 1st leg a hook-like or spine-like process. Giesbrecht (1892) has observed this process in some of these genera, *viz.*, *Metridia*, *Pleuromamma* and *Phyllopus*. The shape of the process shows some variation in the different genera, but it is undoubtedly homologous throughout the whole series (Text-fig. 44, A–M). It appears to be least developed in the genus *Metridia*, and Giesbrecht remarks that it is marked only in *M. normani;* in *M. princeps* it forms only a small rounded projection; in *Pleuromamma*, *Lucicutia* and *Hemirhabdus*, as well as in *Phyllopus* and *Pachyptilus*, it takes the shape of a triangular pointed process; and in *Disseta*, *Heterorhabdus* and *Mesorhabdus* it presents a swollen base from which arises a tapered flagellum, delicate in *Disseta* but stout in *Mesorhabdus*. I am unable to offer any suggestion regarding the function of this organ.



TEXT-FIG. 44.—Process on the posterior aspect of the 2nd basal segment in different species: A, *Metridia princeps*. B, *Heterostylites longicornis*. C, *Lucicutia flavicornis*. D, *Lucicutia challengeri*. E, *Pyhllopus muticus*. F, *Pleuromamma abdominalis*. G, *Pleuromamma xiphias*. H, *Pleuromamma indica*. I, *Pachyptilus eurygnathus*. J, *Disseta palumboi*. K, *Heterorhabdus abyssalis*. L, *Heterorhabdus spinifrons*. M. *Mesorhabdus angustus*.

Genus *Metridia* Boeck.

Metridia, Giesbrecht, 1892, p. 339; Giesbrecht and Schmeil, 1898, p. 105.

Metridia princeps Giesbrecht.

Metridia princeps, Giesbrecht, 1892, p. 340, pl. xxxiii, figs. 3, 18, 35, 40; Wolfenden, 1908, p. 15, pl. iii, figs. 3–5; A. Scott, 1909, p. 121, pl. xxxviii, figs. 1–7; Sars, 1925, p. 194, pl. liiii, figs. 1–12; Wilson, 1932, p. 122, fig. 81, *a–c*; Wolfenden, 1908, p. 15, pl. iii, figs. 3–5; *idem*, 1911, p. 287, pl. xl, figs. 8–13.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 4 females, adult, and 1 juv., 1 male, juv.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 male, adult.
Sta. 76, Gulf of Oman, 1500–0 m., 1 female.
Sta. 96, Central part of Arabian Sea, 645–400 m., 1 male, adult.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m. vertical, 5 females, adult, 1 female, juv.
Sta. 172, Central part of Arabian Sea, 400–0 m., 1 male; 850–0 m., 3 females, adult, 1 male, adult, 1 male, juv.

DISTRIBUTION.—This species is very widely distributed throughout all the great oceans. It has been recorded from the west coast of South America in lat. 3° S., long. 99° W. (Giesbrecht), the San Diego region of the Californian coast (Esterly), the Antarctic Ocean in lats. 66° 30′ to 76° S. (Farran), the Malay Archipelago (A. Scott), the Bay of Bengal and Laccadive Sea (Sewell), the Arabian Sea (present records), east of Cape Colony (Cleve), the South Atlantic (Wolfenden), the North Atlantic (Sars, Lysholm and Nordgaard, Rose), the Bay of Biscay and the west coast of Ireland (Farran), the Gulf of Maine (Bigelow), the Woods Hole region (Wilson), and to the south of Davis Strait (Jespersen).

The Depth distribution appears to be rather deep, and Wilson (1932, p. 123) suggests that "*princeps* is more of a bottom form than any other species of the genus." That it is a deep dwelling form is certain; the depths at which it has been taken in different regions is given below:

West of Greenland and in Davis Strait		500 to 2000 metres.
South of Iceland		1000 ,, 1300 ,,
West of Ireland		500 ,, 2100 ,,
North Atlantic	optimum	1000 ,, 2000 ,,
Bay of Biscay	optimum	550 ,, 1830 ,,
	down to	2740 ,,
South Atlantic		1000 ,, 3000 ,,
East of Cape Colony		780 ,, 900 ,,
Arabian Sea		400 ,, 1500 ,,
	optimum	850 ,, 1500 ,,
Laccadive Sea and Bay of Bengal		730 ,, 1280 ,,
Malay Archipelago		700 ,, 1500 ,,
Antarctic Ocean		1000 ,,
East Pacific and San Diego region		732 ,, 1800 ,,

It has, however, on four occasions, thrice in the North Atlantic Ocean (Sars) and once in the Malay Archipelago (A. Scott), been taken on the surface.

Genus *Pleuromamma* Giesbrecht.

Pleuromamma, Giesbrecht, 1892, p. 347; Giesbrecht and Schmeil, 1898, p. 108.

Pleuromamma abdominalis (Lubbock).

Pleuromamma abdominalis, Giesbrecht, 1892, p. 347, pl. v, fig. 8; pl. xxxii, figs. 3, 5, 13, 22, 25–30; pl. xxxiii, figs. 43, 44, 48, 49, 52.
Pleuromamma abdominalis, Steuer, 1932, p. 9, figs. 21–51.

Occurrence:

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 2 females, 4 males, 12 juv.; 1500–0 m., 4 females, 1 juv., male.
Sta. 145, Maldive area, 300–0 m. vertical, 1 female; 500–0 m. vertical, 1 female.
Sta. 172, Central area of Arabian Sea, 200–0 m., 6 juv.; 400–0 m., 21 examples; 850–0 m., 17 examples.

Descriptive Notes.—Several different forms of this species have been described, namely—

f. *typica*.
f. *edentata*.
f. *abyssalis*, sub-f. *hypothermophila*.
sub-f. *thermophila*.

So far as I have been able to discover, all the specimens in the present collection belong to f. *typica*.

Distribution.—This species is widely distributed throughout all three great Oceans; for details of the distribution I refer the reader to the account given by Steuer (1932, pp. 45 and 58, Charts 2–7).

Pleuromamma indica Wolfenden.

Pleuromamma indica, Wolfenden, 1906, p. 1011, pl. xcvi, figs. 24–26, 31–33; Sewell, 1932, p. 265, text-fig. 89, *a–f*; Steuer, 1932, p. 17, text-figs. 52–68.

Occurrence:

Sta. 76, Gulf of Oman, 1500–0 m., 2 females.
Sta. 172, Central area of Arabian Sea, 400–0 m., 1 female; 850–0 m., 1 male.

Distribution.—This species occurs in the Indian Ocean and its offshoots, the Gulf of Oman and Persian Gulf, and the Gulf of Aden and Red Sea. It has also been taken in the South Atlantic Ocean off the west coast of Africa. Steuer regards it as a visitor to the Atlantic. For details of its distribution I refer the reader to Steuer's account (1932, pp. 47, 61, Charts 8, 9).

Pleuromamma quadrungulata (F. Dahl).

Pleuromamma quadrangulata, Wolfenden, 1911, p. 289, text-fig. 47.
Pleuromamma quadrungulata, Dahl, 1893, p. 105; Sewell, 1932, p. 267, text-fig. 90, *a–e*; Steuer, 1932, p. 26, text-figs. 92–110; Esterly, 1911, p. 329, pl. xxx, fig. 6; pl. xxxii, fig. 111.

Occurrence:

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 6 specimens; 1500–0 m., 7 specimens.
Sta. 145 C, Maldive area, 300–0 m., vertical, 4 females.

Sta. 145 D, Maldive area, 100–0 m., vertical, 2 females, 300–0 m. vertical, 1 female; 500–0 m. vertical, 1 female, 1 male.

Sta. 172, Central area of Arabian Sea, 400–0 m., 7 specimens.

Descriptive Notes.—All examples belong to f. *typica* Steuer.

Distribution.—This species occurs in the Atlantic, Indian and Pacific Oceans. For details of its distribution I refer the reader to Steuer's account (1932, pp. 49, 63, charts 12, 13).

Pleuromamma xiphias (Giesbrecht). (Text-fig. 45, A–J.)

Pleuromamma xiphias, Giesbrecht, 1892, p. 347, pl. xxxii, fig. 14, pl. xxxiii, figs. 42, 45, 50; Wolfenden, 1906, p. 1012, pl. xcvi, figs. 27, 37–39; Sars, 1925, p. 202, pl. lv, figs. 1–12; Wilson, 1932, p. 124, fig. 82, *a*, *b*; Sewell, 1932, p. 269, text-fig. 91; Steuer, 1932, p. 5, text-figs. 1–20.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 321 females, 155 males.

Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 3 females, 2 males; 1500–0 m. vertical, 17 females, 20 males.

Sta. 145 C, Maldive area, 300–0 m. vertical, 1 female, 1 male; 500–0 m. vertical, 7 females, 5 males.

Sta. 145 D, Maldive area, 300–0 m. vertical, 3 males; 500–0 m. vertical, 4 females, 4 males.

Sta. 172, Central part of Arabian Sea, 200–0 m., 4 females; 400–0 m., 125 males, 97 females; 850–0 m., 139 females, 108 males; 2091–0 m., 1 female.

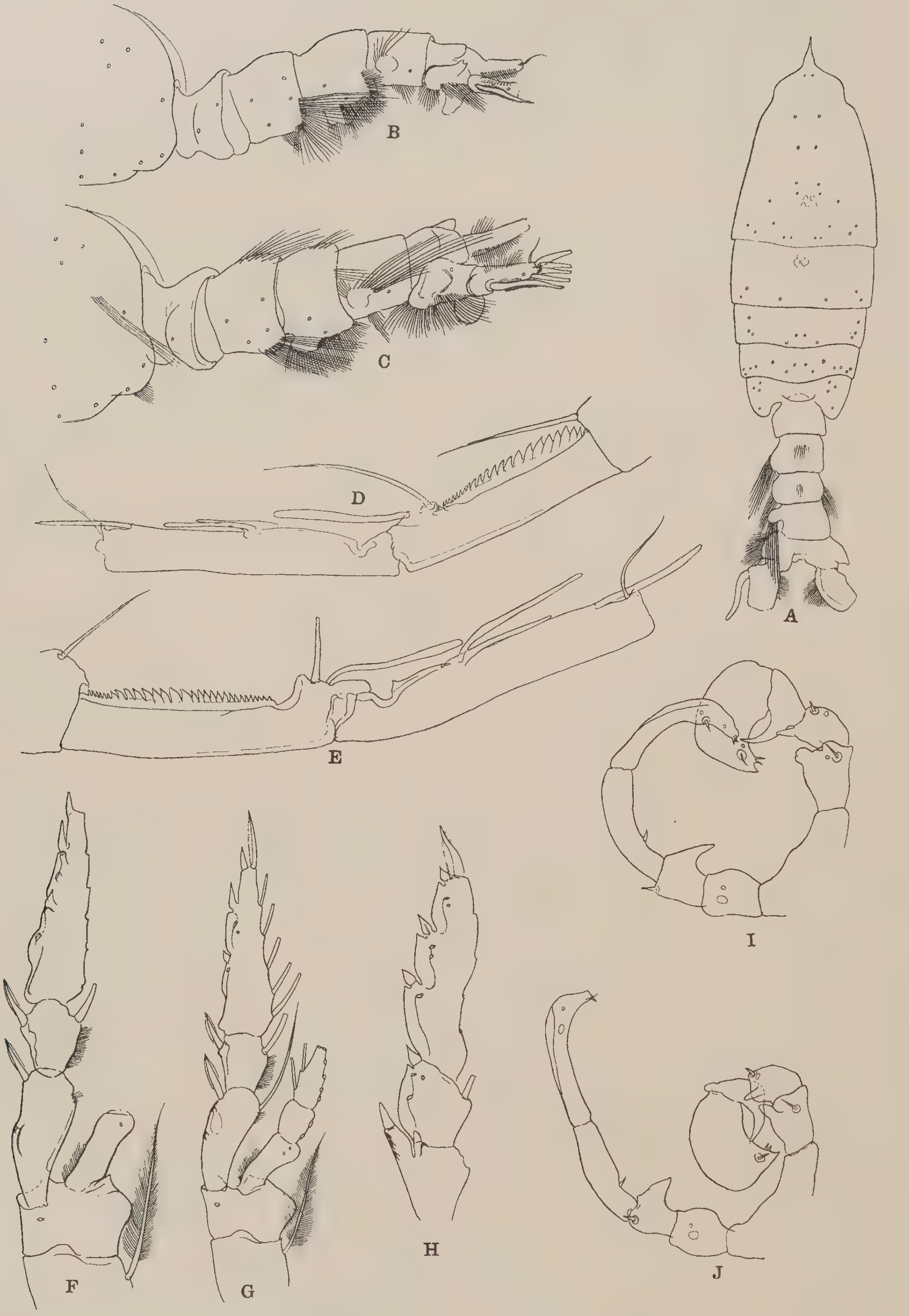
Sta. 186, Gulf of Aden, 575 and 600–0 m., 32 specimens; 960–0 m., 33 females, 42 males.

Descriptive Notes.—Steuer (1932, p. 70) has called attention to the occurrence in this species of two groups of individuals that differ markedly from each other in size, examples of the larger size occurring in the Atlantic region and smaller specimens being taken in the Indian Ocean, while examples of both groups occur in the western part of the latter region; he also has shown that these two size groups inhabit different water strata, the smaller forms being taken at depths of 450–550 metres and the larger forms below 600 metres. Steuer provisionally concludes that we have in this species two separate races, the larger race inhabiting the water of the Sub-polar Intermediate current and the smaller race the stratum overlying this; within both these races there is a variation in size with the depth, those individuals occurring at higher levels being smaller than those living more deeply.

In the present collection the great majority of specimens belong to the smaller race, but a few examples of the larger race were taken at certain stations, namely:

Sta. 131	500–0 m.	1 female, 1 male.
	1500–0 m.	8 females, 9 males.
Sta. 172	850–0 m.	2 females, 4 males.

These figures definitely suggest that in the southern part of the Arabian Sea (Sta. 131) the larger race is in the main to be found at some depth below 1500 m., at which level the proportion of large and small forms is almost equal, the catch consisting of 9 females and 11 males of the small form, and 8 females and 9 males of the large, while at a level above 500 metres the catch consisted of only 2 females and 1 male of the small form, and 1 female



Text-fig. 45.—*Pleuromamma xiphias* (Giesbrecht), ♂. A, Dorsal view. B, Abdomen, lateral view, f. *minor*. C, Abdomen, lateral view, f. *major*. D, 1st antenna, hinge joint, f. *minor*. E, 1st antenna, hinge joint, f. *major*. F, 2nd leg, right side, f. *major*. ♂. G, 2nd leg, right side, f. *minor*, ♂. H, 3rd leg, exopod, f. *major*. I, 5th pair of legs, f. *major*. J, 5th pair of legs, f. *minor*.

and 1 male of the large race. Further to the north-west, at Sta. 172 in the central region of the Arabian Sea, the small form predominated, and in the catch from 850–0 metres there were 137 females and 104 males of the small form, and only 2 females and 4 males of the large.

Steuer states that in the "Valdivia" collection the smallest examples were obtained from the Gulf of Aden, and he refers to these specimens as "dwarf forms"; in the present collection the smallest examples came from the Maldive Area, Sta. 145. In the following Table I give the average sizes of both sexes in both f. *minor* and f. *major* at the various stations:

f. *minor*.

Depth. (m.)	Sta.	Average total length.	
		Female. (mm.)	Male. (mm.)
300–0	Sta. 145, Maldive area	..	4·292
400–0	,, 172, centre of Arabian Sea	4·430	4·759
500–0	,, 145, Maldive area	4·133	4·235
500–0	,, 131, southern part of Arabian Sea	4·275	..
575–0	,, 186, Gulf of Aden	4·268	4·558
600–0	,, 186, ,, ,,	4·292	4·547
645–400	,, 96, centre of Arabian Sea	4·369	4·478
850–0	,, 172, ,, ,,	4·520	4·618
1500–0	,, 131, southern part of Arabian Sea	4·319	4·400

f. *major*.

Depth. (m.)	Sta.	Female. (mm.)	Male. (mm.)
500–0	,, 131, southern part of Arabian Sea	4·967	5·017
850–0	,, 172, centre of Arabian Sea	4·536	5·900
1500–0	,, 131, southern part of Arabian Sea	5·379	5·554

From the above there appears to be the usual correlation between depth of occurrence and size of specimens: but there is, further, a very definite correlation between size and habitat; thus the smallest examples were taken, as mentioned above, in the Maldive region. This is clearly seen if we arrange the above table in accordance with the size of the specimens as follows:

f. *minor*.

Average total length.		Sta.	Depth. (m.)
Female. (mm.)	Male. (mm.)		
4·133	4·235	Sta. 145, Maldive area	500–0
4·268	4·558	,, 186, Gulf of Aden	575–0
4·275	..	,, 131, southern part of Arabian Sea	500–0
4·292	4·547	,, 186, Gulf of Aden	600–0
4·319	4·400	,, 131, southern part of Arabian Sea	1500–0
4·369	4·478	,, 96, centre of Arabian Sea	645–400
4·430	4·759	,, 172, ,, ,,	400–0
4·520	4·618	,, 172, ,, ,,	850–0

f. *major*.

Average total length: Female. (mm.)	Average total length: Male. (mm.)	Sta.	Depth. (m.)
4·967	5·017	Sta. 131, southern part of Arabian Sea .	500–0
5·379	5·554	,, 131, ,, ,, ,, .	1500–0
5·520	5·900	,, 172, centre of Arabian Sea . . .	850–0

It thus seems clear that both f. *major* and f. *minor* have been subjected to some adverse influence at depths ranging from 300 to 1500 metres at Stas. 96, 131, 145 and 182, and have been little if at all affected at depths of 400 to 850 metres at Sta. 172. The explanation of this would appear to be that the former Stations and depths all lie in the Indian tropical intermediate water, which is inimical to life, whereas the latter lie in the South Polar intermediate water, in which no such harmful influence can be detected.

Structurally there appears to be little difference, apart from size, between these two forms. There are, however, slight differences in the proportional lengths of the segments of the body and the segments of the 1st antenna; the proportional lengths of the segments of the body are as follows:

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–3.	Abd. 4.	Abd. 5.	Furca.
f. *minor*	329	133	67	63	97	130	66	55	60 = 1000
f. *major*	316	120	70	64	94	126	67	55	58 = 1000

There is thus a reduction in the total length of the cephalothorax from 689 to 664 parts per 1000 of the total length, which is mainly due to the comparatively shorter cephalon and 1st thoracic segment. In the abdomen the genital segment is proportionally shorter in the large form, and the furcal ramus also seems to be slightly shorter.

In the 1st antenna of the female the proportional lengths of the various segments in the two forms are as follows:

Segment	1.	2.	3.	4.	5.	6.	7–9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
f. *minor*	82	22	23	23	27	27	43	21	27	48	39	50	54	59	62	59	55	59	40	35	44	49	52 = 1000
f. *major*	84	23	24	26	26	26	39	21	29	50	40	52	56	61	64	61	54	58	38	34	42	45	48 = 1000

There appears to be but little difference in the proximal segments, but from segment 7 to 18 each segment is proportionally slightly longer in f. *major* than in f. *minor*, whereas from segment 19 to the end of the appendage the segments are proportionally somewhat shorter in the larger form. It is interesting to note that these differences in the proportions of the two forms agree very closely with the differences that I have previously (Sewell, 1929 and 1932) shown to be present in the various copepodid and adult stages in almost any given species.

Distribution.—This species is widely distributed throughout the Atlantic, Indian and Pacific Oceans, and has very occasionally been taken in the Antarctic Ocean. For details of this distribution I refer the reader to the account given by Steuer (1932, pp. 44 and 55, Charts 1 and 2).

Genus *Gaussia* Wolfenden.

Gaussia, Wolfenden, 1905, p. .

Gaussia princeps (T. Scott).

Pleuromma princeps, T. Scott, 1894, p. 42, pl. iii, figs. 8–12.
Gaussia melanotica, Wolfenden, 1905, p. 5, pl. ii, figs. 1–5 (in a revised version of this paper he changed the name to *G. scotti*).
Metridia atra, Esterly, 1906, p. 70, pl. ix, figs. 15, 16, pl. xi, figs. 39, 40, pl. xiii, fig. 78, pl. xiv, fig. 95.
Gaussia scotti, Wolfenden, 1911, p. 290, pl. xxxiii, figs. 3–11.
Gaussia princeps, Sewell, 1932, p. 270, pls. v and vi, text-figs. 92 and 93 *a–f*.

OCCURRENCE :

Sta. 95, Central part of Arabian Sea, 984–430 m., 1 female, 2 males.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 male.

DESCRIPTIVE NOTES.—These specimens agree closely with those taken by the "Investigator" in the Bay of Bengal. The female is without the usual black cementing substance on the genital segment and presumably therefore was not breeding. In the males, as in the examples from the Bay of Bengal (*vide* Sewell, 1932, p. 275), the left 5th leg is clearly divided into four segments, and the terminal one bears three unequal spines on the inner border, thus agreeing with Esterly's account of *Metridia atra*. Unfortunately in my earlier account I inadvertently transposed the two legs; my description of the right leg thus refers to the left and *vice versa*.

DISTRIBUTION.—In the Atlantic Ocean from lat. 20° N., in the tropical region, and as far as lat. 23° S., between 1500 and 3000 metres (Wolfenden). In the Indian Ocean from the central area of the Arabian Sea (present record) and the Bay of Bengal (Sewell). In the Pacific Ocean from the San Diego region of the coast of California (Esterly). In the two latter oceans it occurs in less deep water, ranging from 366 metres to 869 metres.

Family LUCICUTIIDÆ.

Genus *Lucicutia* Giesbrecht.

Lucicutia, Giesbrecht, 1892, pp. 62, 358; Giesbrecht and Schmeil, 1898, p. 110.

Lucicutia bicornuta Wolfenden.

Lucicutia bicornuta, Wolfenden, 1905, p. 24, pl. ii, fig. 6; A. Scott, 1909, p. 126, pl. xxxix, figs. 1–11; Sars, 1925, p. 214, pl. lviii, figs. 1–3.
Lucicutia aurita Sars, 1905, p. 8; 1907, p. 3.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 1500–0 m. vertical, 1 female, 1 male.

DISTRIBUTION.—In the North Atlantic Ocean (Sars), in the South Atlantic Ocean (Wolfenden), in the Arabian Sea (present record), the Bay of Bengal (Sewell) and the Malay Archipelago (A. Scott).

Lucicutia challengeri Sewell.

(?) *Leuckartia flavicornis* (*non* Claus), Brady, 1883, p. 50, pl. xv, figs. 1–6, 16.
Lucicutia challengeri, Sewell, 1932, p. 290, text-fig. 95, *a–j*.

Occurrence :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 12 specimens; 1500–0 m., 11 specimens.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 8 females, 1 male.
Sta. 76, Gulf of Oman, 1500–0 m., 61 females, 12 males, 12 juv.
Sta. 96, Central part of Arabian Sea, 645–400 m., 2 females, 1 juv.
Sta. 172, Central part of Arabian Sea, 850–0 m., 32 specimens; 2091–0 m., 1 male.

Distribution.—This species has now been recorded from the Arabian Sea and Gulf of Oman (present records), the Bay of Bengal and Laccadive Sea (Sewell), and the Pacific and Atlantic Oceans (Brady, as *L. flavicornis*).

Lucicutia flavicornis (Claus).

Leuckartia flavicornis, Giesbrecht, 1892, p. 358, pl. v, fig. 4, pl. xix, figs. 2, 3, 15–17, 21, 23, 29, 38, pl. xxxviii, figs. 38, 40.
Lucicutia flavicornis, Esterly, 1905, p. 180, fig. 36, *a–c*; Farran, 1926, p. 274, pl. ix, figs. 1–3.

Occurrence.—Sta. 61, Northern area of Arabian Sea, surface, 1 female.

Descriptive Notes.—Farran (*loc. cit.*) has called attention to the existence of two very closely allied species, *L. flavicornis* (Giesbrecht) and *L. gemmina* Farran, which differ in size and in certain small differences of structure. The true *L. flavicornis* is the smaller of the two and, according to Farran, has a length measurement of 1·47–1·58 mm. in the female and 1·44–1·56 mm. in the male. The present specimen has a length measurement of 1·466 mm.

Distribution.—This species appears to be widely distributed throughout all three great Oceans. In the Pacific it has been recorded from San Francisco Bay and the San Diego region of the coast of California (Esterly), between lats. 12° N. and 3° S. and longs. 87° to 128° W. (Giesbrecht), off New Zealand, and on the Australian Barrier Reefs (Farran) and in the Malay Archipelago (A. Scott). In the Indian Ocean from the coast of Southern Burma and Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present record), the Red Sea (A. Scott), and the Agulhas Current (Cleve). In the Atlantic Ocean from the west of Cape Colony (Cleve), the Gulf of Guinea (T. Scott), in the tropical Atlantic (Giesbrecht, Wolfenden), the Antilles and Florida currents (Cleve), in the Sargasso Sea (Cleve), the temperate Atlantic (Sars, Rose), off the Canary Islands (Thompson) and the Azores (Cleve), in the Bay of Biscay (Farran), off the west coast of Ireland (Farran, Pearson), and in the Mediterranean Sea (Claus, Steuer, Pesta).

Lucicutia magna Wolfenden.

Lucicutia magna, Wolfenden, 1904, p. 121, pl. ix, figs. 35, 35*a*; 1911, p. 316, fig. 59; Wilson, 1932, p. 130, fig. 88, *a–c*.
Lucicutia atlantica, Wolfenden, 1904, p. 121; Farran, 1905, p. 44, pl. xiii, figs. 5–10; Sars, 1925, p. 217, pl. lix, figs. 1–5.

Occurrence.—Sta. 145 C, Maldive area, 500-0 m. vertical, 1 female.

Distribution.—Originally described from the Faroe Channel (Wolfenden), this species has since been obtained from the west coast of Ireland and the Bay of Biscay (Farran), the western part of the Mediterranean Sea and off the Azores (Sars), the Woods Hole region of the coast of North America (Wilson), the South Atlantic Ocean and the Antarctic Ocean (Wolfenden), the Maldive area (present record), the Pacific Ocean (Sars), and the Pacific region of the Antarctic Ocean (Farran).

Family Heterorhabdidæ.

Genus *Heterorhabdus* Giesbrecht.

Heterorhabdus, Giesbrecht, 1892, p. 372; Giesbrecht and Schmeil, 1898, p. 113.

Heterorhabdus abyssalis (Giesbrecht). (Text-fig. 46, a–h.)

Heterochæta abyssalis, Giesbrecht, 1892, p. 373, pl. xix, fig. 4, pl. xx, figs. 29, 30.
Heterorhabdus abyssalis, Farran, 1905, p. 45; 1926, p. 280.

Occurrence:

Sta. 96, Northern area of Arabian Sea, 645–400 m., 4 females, 1 male.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 145 D, Maldive area, 500–0 m. vertical, 1 male.
Sta. 172, Central area of Arabian Sea, 400–0 m., 2 females; 850–0 m., 2 females.

Descriptive Notes.—♀. These examples appear to be considerably larger than specimens from the Atlantic Ocean, and measure from 3·08 to 3·1 mm. in length. Farran's examples from the Bay of Biscay showed a length measurement that ranged from 2·2–2·6 mm. The proportional lengths of the various segments of the body are as follows, and for convenience of reference I have also given these lengths in specimens of *abyssalis* and *norvegicus* from the Irish coast, which were very kindly sent me by Mr. G. P. Farran.

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
abyssalis (Indian Ocean)	302	116	88	88	114	122	44	38	27	70 = 1000.
abyssalis (Irish coast)	318	104	79	79	116	132	43	34	21	74 = 1000.
norvegicus (Irish coast)	323	103	76	76	121	130	45	35	20	71 = 1000.

There are thus slight differences in the proportional lengths of certain of the segments in the Indian form and that from the Irish coast, but these are not sufficiently marked to serve as valid grounds for distinguishing the two forms.

The forehead is rounded and there is no trace of any spine, such as is found in *spinifrons*. A well-marked cervical groove is present. The posterior thoracic margin is rounded. In the abdomen the genital segment is constricted in the posterior third of its length. The genital aperture closely resembles that of *norvegicus* and *austrinus*, but the aperture is further forward than in this latter species. The genital segment and the next two following (Text-fig. 46, *a*) are fringed along their posterior margins with small spinules. The furcal rami are of unequal length and the 2nd seta on the left ramus is thickened and greatly increased in length.

The 1st antenna over-reaches the furcal rami by about the last three segments. The proportional lengths of the various segments are as follows, and for reference I also give the lengths in a specimen of *abyssalis* from the Irish coast and of *norvegicus* from the same region:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
abyssalis (Irish coast)	87	12	10	10	12	18	18	18	19	25	32	31	53	57	62	64	65	62	67	55	50	54	52	51	16 = 1000.
abyssalis (Indian Ocean)	82	13	12	10	11	15	19	16	17	22	31	28	50	56	60	63	65	65	72	58	53	57	56	51	18 = 1000.
norvegicus (Irish coast)	80	12	10	10	11	13	16	15	17	19	28	27	50	56	60	64	65	65	72	63	54	60	60	53	20 = 1000.

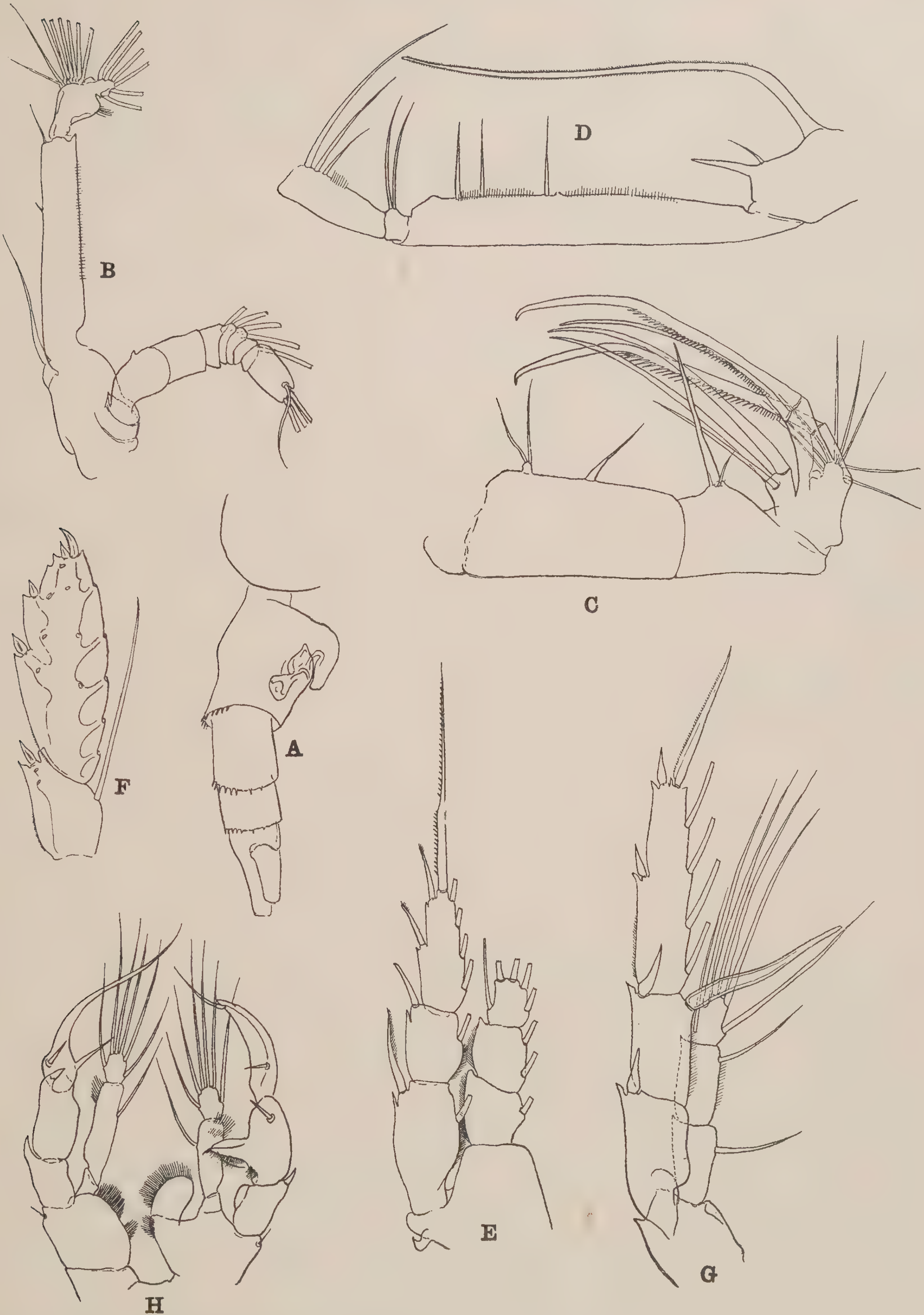
It seems clear that these proportional lengths exhibit slight differences in the three forms, and that these differences are progressive as we pass from the smallest form, *abyssalis* from the Irish coast, through *abyssalis* from the Indian Ocean to *norvegicus* from the Irish coast. Segment 1 decreases in length; in segments 2 to 5 the differences are slight and appear to be irregular, but from 6 to 16 the length is almost invariably smaller in the larger form; segment 17 remains the same length in all three forms; from segment 18 to the end the length of the segment increases as we pass from the smaller to the larger form. These differences are the exact opposite of what I have usually found to occur in growth stages of the same species (*vide* Sewell, 1929, p. 9). In all three forms the joints between segments 8, 9 and 10 appear to be more or less incomplete, so that there can be little or no flexibility in this portion of the appendage. The proximal segments bear long sensory filaments, and two at the distal end of segment 1 and one each on segments 3, 7 and 12 are especially long.

The 2nd antenna and mouth parts (Text-fig. 46, B–D) resemble those of other members of the genus: the 2nd maxilla appears to be identical in all three forms and closely resembles that of *H. austrinus* Giesbrecht.

In the 1st leg (Text-fig. 46, E) the 2nd basal segment bears on its outer margin a stout curved process, that is in all probability a modified seta; it projects backwards, and is thus best seen when the animal is viewed from the side. So far as I am aware, no such process has been described in any other member of the genus; Giesbrecht (1892, pl. xx, fig. 24) has figured it in *H. spinifrons*, but I can find no reference to it in the text: an exactly similar process is present in *H. norvegicus*. The inner seta arising from the 2nd segment of the exopod is somewhat stouter than those arising from segment 3; this condition is also present in *H. norvegicus*.

In the 3rd leg (Text-fig. 46, F) the last segment of the exopod, is oval and very closely resembles that of *H. spinifrons*.

In the 5th leg (Text-fig. 46, G) the 1st segment of the exopod is devoid of any inner seta, and the setæ arising from 1st and 2nd segments of the endopod are considerably more delicate than those of the 3rd segment; the same difference is present in *H. norvegicus*. The end spine in the Indian form is somewhat longer in proportion to the length of



Text-fig. 46.—*Heterorhabdus abyssalis* (Giesbrecht). a, Abdomen, from the right side, ♀. b, 2nd antenna, ♀. c, 2nd maxilla, ♀. d, Maxilliped, ♀. e, 1st leg, ♀. f, 3rd leg, exopod, ♀. g, 5th leg, ♀. h, 5th pair of legs, ♂.

the 3rd segment of the exopod than in either *H. abyssalis* from the Irish coast or in *H. norvegicus*; the proportional lengths in the three forms are as follows:

Species.	Proportional lengths of— Exopod 3.	Proportional lengths of— Endspine.
abyssalis (Indian Ocean)	100	60
abyssalis (Irish coast)	100	50
norvegicus (Irish coast)	100	47

♂. Total length 2·85 mm.

The proportional lengths of the various segments of the body are as follows, and for comparison I have given the corresponding lengths of the segments in specimens of *H. norvegicus* and *H. abyssalis* from the Irish coast:

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
abyssalis (Irish coast)	309	112	86	90	112	66	54	46	40	20	65 = 1000.
abyssalis (Indian Ocean)	312	108	86	86	108	65	53	51	40	25	63 = 1000.
norvegicus (Irish coast)	312	104	89	89	104	62	55	47	39	26	73 = 1000.

There is thus little difference between these three forms.

In the grasping antenna the proportional lengths of the segments forming the hinge-joint are almost identical, as is shown below:

	abyssalis. Irish coast.	*abyssalis.* Indian ocean.	*norvegicus.* Irish coast.
Segment 17	28	27	26
,, 18	13	13	13
,, 19–21	59	60	61

I have been entirely unable to detect any difference in the mouth parts and swimming legs of these three forms, and it seems clear that Farran is correct in thinking that *abyssalis* and *norvegicus* are races or forms of the same species.

Remarks.—It is extremely difficult, if not impossible, in the present state of our knowledge, to discriminate between several "species" of *Heterorhabdus.* Farran (1926, p. 281) remarks: "It is not perfectly clear whether these specimens (of what he considers to be *norvegicus* from the Bay of Biscay) are true *H. norvegicus* or a closely-allied southern form, perhaps *H. profundus.*" Again, in 1929 (p. 265), in his Report on the Copepoda of the "Terra Nova" expedition, he states that in examples of what he took to be *austrinus* "the females scarcely differ, except in their slightly larger size, from the North Atlantic species which I have referred to *H. norvegicus*, but the more slender inner edge spine on the second joint of the exopodite of the 5th foot in *H. austrinus* seems in most cases to be a diagnostic character." It would be out of place to attempt here to elucidate this problem, but from the above it would seem probable that *norvegicus*, as understood by Farran, and *abyssalis* are size groups of one and the same species; and it is interesting to note that Farran also found similar size groups in *H. austrinus.*

Distribution.—The form *norvegicus* appears to be confined to the Arctic and North Atlantic Oceans: it has been recorded from the Polar Basin (Sars), the Arctic Ocean (Mrazek, Damas and Koefoed, van Höffen), the Norwegian coast (Boeck, Sars), the Faroe Channel (Norman, Wolfenden), Greenland (Norman, Jespersen), the North Atlantic (Sars, Lysholm and Nordgaard), the Irish coast (Farran), the Bay of Biscay (Farran), the Gulf of Maine (Bigelow) and the region off Georges Bank (Wilson). The vertical range appears to be from 100–2000 metres, but the depth seems to differ on the two sides of the Atlantic, for on the eastern side, off Ireland and in the Bay of Biscay the range is given by Farran as 350 to 732 metres, in the central region it occurs from 150 to 1500 metres and is common at 1000 metres, whereas off Greenland it may occur as deep as 2000 metres.

The form *abyssalis* appears to be an Atlantic and Indian Ocean form. It has been recorded from the North Atlantic (van Breemen), the Irish coast (Farran), the Bay of Biscay (Farran), west of Cape Verde Islands (Wolfenden), east of Cape Colony (Cleve), the Arabian Sea and Maldive area (present records), and the Arabian Sea and Gulf of Aden (Thompson and A. Scott). The depth at which this form is found seems to be rather less deep than that of *norvegicus* in the Atlantic Ocean; it occurs off the Irish coast at about 220 metres, and in the Bay of Biscay its optimum lies between 183 and 366 metres.

Off the east coast of Cape Colony below the Agulhas Current it was taken between 530 and 900 metres, and in the Arabian Sea it lies at depths ranging from 400–1500 metres.

Sars (1925, p. 226) has recorded that *H. norvegicus* has been taken in the Pacific Ocean. I am inclined to doubt this, and think that it is more likely that he was actually dealing with *H. abyssalis*; unfortunately he does not give the size of these specimens.

Heterorhabdus spinifrons (Claus).

Heterochæta spinifrons, Giesbrecht, 1892, p. 372, pl. xx, figs. 1, 3, 11, 16, 19, 31, pl. xxxix, figs. 42, 43, 51, 52, 54.

Heterorhabdus spinifrons, Esterly, 1905, p. 183, fig. 37, *a*, *b*; van Breemen, 1908, p. 119, fig. 137, *a–c*; Sars, 1925, p. 227, pl. lxii, figs. 9–12.

Occurrence:

Sta. 96, Northern area of Arabian Sea, 645–400 m., 2 males.

Sta. 172, Central part of Arabian Sea, 200–0 m., 1 male; 400–0 m., 1 female; 850–0 m., 1 male.

Sta. 186, Gulf of Aden, 575–0 m., 4 females, 1 male.

♀. The total length of the present examples is 3·433 mm. The forehead shows the characteristic spinous projection on the rostral papilla. In the abdomen the genital swelling is well marked, and on the anterior border are a pair of unequal small rounded prominences, that on the right side being considerably the larger.

The 1st antenna overreaches the tip of the furcal rami by about the last three or four segments. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	79	10	10	10	10	12	17	15	18	22	32	28	57	60	64	66	67	63

19.	20.	21.	22.	23.	24–25.	
72	59	52	58	53	66	= 1000.

There are four very long sensory filaments arising from the 1st segment and one each from the 2nd, 3rd, 4th and 7th segments. The 1st segment bears three pores, one each near the base of origin of the corresponding "trithek."

The 2nd antenna resembles that of other members of the genus.

In the mandible the two rami of the palp are of equal length: the biting ramus resembles that of *H. papilligera.*

In the 1st maxilla the 2nd inner lobe bears 1 seta and the 3rd has none; the 2nd basal segment and endopod are greatly reduced and bear 1 and 3 small setæ respectively; the exopod is well developed and carries 5 setæ, and the outer lobe also bears 5.

The 2nd maxilla is armed on the 6th lobe with a stout spine, the proximal two-thirds of which is fringed with teeth. From the 5th lobe two unequal stout spines arise, the stronger being fringed with very small spinules. The 4th lobe bears two long stout spines and one short one, this latter being only about one-fifth the length of the other two. The 3rd lobe bears a stout spine, that is half the length of those arising from the 5th lobe, and a small delicate seta.

In the maxilliped the 1st basal segment bears the characteristic long filament on its anterior margin, and at the distal anterior angle is produced in a pointed process that extends about one-third the length of the 2nd basal segment.

The 1st leg bears on the outer border of the 2nd basal segment a stout process that is directed backwards; this is figured by Giesbrecht (1892, pl. xx, fig. 24).

The 2nd, 3rd and 4th legs resemble those of the preceding species, *H. abyssalis.*

In the 5th leg the 1st segment of the exopod is devoid of any inner seta, and the setæ arising from the 1st and 2nd segments of the endopod are much more delicate than those on segment 3. The inner spine on the 2nd segment of the exopod is stout, and approximately equal in length to the 3rd segment. The terminal spine on the 3rd segment is about one-third the length of the segment.

Distribution.—In the Atlantic Ocean this species has been taken in the North Atlantic (Sars), the Gulf of Maine (Bigelow), the Woods Hole region (Wilson), the west coast of Ireland (Farran, Pearson), the Bay of Biscay (Farran), the Mediterranean Sea (Thompson, Thompson and A. Scott, Pesta), equatorial and south Atlantic (Wolfenden), the Gulf of Guinea (T. Scott) and west of Cape Colony (Cleve). In the Indian Ocean off the east coast of Cape Colony (Cleve), the Arabian Sea (Thompson and A. Scott, present records), the Gulf of Aden (present records) and the Laccadive Sea (Thompson and A. Scott, Sewell). In the Pacific Ocean from the Malay Archipelago (A. Scott), the Australian Barrier Reefs (Farran), off New Zealand (Farran), both east and west regions of the Pacific Ocean (Giesbrecht) and off the San Diego region of the coast of California (Esterly).

The depth distribution has a wide range; off Ireland it is said to extend from 0 to 1770 fathoms (3237 metres), but in the Bay of Biscay Farran shows it as extending from 50 fathoms (91 metres) to 500 fathoms (914 metres), with an optimum between 100 and 150 fathoms (183 to 272 metres). Off Cape Colony it was taken at 250 to 530 metres, in the Arabian Sea between 400 and 850 metres, in the Laccadive Sea between 366 and 1280 metres, and in the central Pacific Ocean and on the Barrier Reef in 500 metres, but off New Zealand in only 0–50 metres.

Genus *Heterostylites* Sars.

Heterostylites, Sars, 1920.

Heterostylites longicornis (Giesbrecht).

Heterochœta longicornis, Giesbrecht, 1892, p. 373, pl. xx, figs. 14, 21, 25, 26, pl. xxxix, fig. 44.
Heterostylites longicornis, Sars, 1925, p. 238, pl. lxvii, figs. 1–16.

Occurrence :

Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 female, 1 male.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female.

Distribution.—In the Atlantic Ocean from the Faroe Channel (Wolfenden), the west coast of Ireland (Farran), the Bay of Biscay (Farran), the North Atlantic (Sars), the Gulf of Maine (Bigelow), the Woods Hole region (Wilson), the South Atlantic (Wolfenden), the Antarctic Ocean (Wolfenden). In the Indian Ocean from the Arabian Sea and Gulf of Oman (present records) and the Bay of Bengal (Sewell). In the Pacific Ocean from the Malay Archipelago (A. Scott) and the San Diego region of the coast of California (Esterly).

Genus *Hemirhabdus* Wolfenden.

Hemirhabdus, Wolfenden, 1911, p. 308.

Hemirhabdus grimaldii (Richard).

Heterochœta grimaldii, Richard, 1893, p. 151.
Heterorhabdus grimaldii, Wolfenden, 1905, p. 10, pl. iv, figs. 3–5.
Hemirhabdus grimaldii, Wolfenden, 1911, p. 309, text-fig. 56 ; Sars, 1925, p. 230, pl. lxiii, figs. 1–15 ; Sewell, 1932, p. 304, text-fig. 100, *a–f*.

Occurrence :

Sta. 131 D, Southern area of Arabian Sea, 1500 m., 1 male.
Sta. 172, Central area of Arabian Sea, 2091–0 m., 1 female.

Distribution.—This fine species has now been recorded from Greenland to the south of Davis Strait (Jespersen), off the west coast of Ireland (Farran), in the Bay of Biscay (Farran, Sars), south of the Canary Islands (Sars), near the Cape Verde Islands (Wolfenden), in the Arabian Sea (present records), in the Bay of Bengal (Sewell) and, according to Sars, in the Pacific Ocean.

Hemirhabdus truncatus (A. Scott).

Mesorhabdus truncatus, A. Scott, 1909, p. 132, pl. xxxix, figs. 12–21.
? *Hemirhabdus latus*, Sars, 1925, p. 232, pl. lxiv, figs. 1–16.
Hemirhabdus truncatus, Sewell, 1932, p. 306, text-fig. 101, *a–j*.

Occurrence :

Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 1 juv.
Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

Descriptive Notes.—This single adult specimen agrees exactly with the example previously recorded by me from the Laccadive Sea, except that it is considerably larger in size. The total length is 9·667 mm., instead of only 7·44 mm. ; but the proportions of the body and the relative length of the abdomen are the same, the latter being contained 2·62 times in the cephalothorax.

Distribution.—This species is now known from the Malay Archipelago (A. Scott), the Laccadive Sea (Sewell) and the Arabian Sea (present record); and, if I am right in thinking that *Hemirhabdus latus* is a synonym, it also occurs in the Pacific and Atlantic Oceans (Sars).

Genus *Mesorhabdus* Sars.

Mesorhabdus, Sars, 1905*b*, p. 9.

Mesorhabdus angustus Sars. (Text-fig. 47, A–G.)

Mesorhabdus angustus, Sars, 1925, p. 236, pl. lxvi, figs. 14–20.

Occurrence:

Sta. 61 C, Northern part of Arabian Sea, 1500–0 m., 1 female.
Sta. 76, Gulf of Oman, 600–0 m., 1 female, 1 male, 2 juv.

Descriptive Notes.—♀. Total length, 7·25 mm.

The proportional lengths of the cephalothorax and abdomen are as 65 to 35. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
339	97	68	63	82	102	54	45	57	93 = 1000.

The forehead is rounded. The base of the rostral papilla is produced in a low rounded prominence that bears two delicate filaments. A well-marked cervical groove runs across the dorsal aspect of the cephalon. The 4th and 5th thoracic segments are fused and the posterior thoracic margin is truncated. The genital segment is equal in length to the two following segments; the genital prominence is not much produced. The furcal rami are markedly unequal, and the 2nd seta on the left ramus is much thickened and of great length, being about twice the length of the whole animal.

The angle of the posterior thoracic margin is occupied by a compact mass of highly refractile gland cells that open on the external surface by a number of orifices. A number of dermal glands are scattered over the dorsal and lateral aspects of the segments of both regions of the body, and a small but compact gland is situated in the base of each furcal ramus. A similar gland is present in the proximal part of the 1st basal segment of the 2nd to 4th legs.

The 1st antenna over-reaches the tip of the furca by the last six segments.

The proportional lengths of the segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	68	16	22	24	26	25	25	21	21	24	29	33	48	48	55	62	66	63

19.	20.	21.	22.	23.	24.	25.
74	59	46	46	46	41	12 = 1000.

The sensory filaments on the basal segments are long, as in *Heterorhabdus spinifrons*.

In the 2nd antenna the 1st basal segment is produced in a rounded lobe at its posterior and inner angle; the exopod reaches only about half-way along the 1st segment of the endopod.

The mandible resembles that of *M. brevicaudatus*.

In the 1st maxilla the various lobes bear the following number of setæ :

Li. I . .	10 delicate setæ and 1 strong spine.
Li. II . .	1 seta.
Li. III . .	2 setæ.
Basal 2 . .	2 ,,
Endopod .	5 ,,
Exopod . .	5 small and 6 large setæ.
Le. . .	6 large setæ, the most posterior somewhat smaller than the other 5, and 3 small setæ.

Sars (*loc. cit.*, p. 235) states that in *M. brevicaudatus* this appendage resembles that of *Hemirhabdus*, but in all three species of *Mesorhabdus* the 1st inner or biting lobe is characterized by the presence of a single, long and powerful spine, the remaining setæ being delicate ; in *Hemirhabdus* no such spine is present.

The 2nd maxilla (Text-fig. 47, B) has the same general shape as in *M. brevicaudatus*, but the 3rd and 4th lobes each bear only 2 setæ, whereas Sars figures 3 setæ in both *brevicaudatus* and *gracilis*.

The maxilliped resembles that of other members of the genus.

In the swimming legs the number of setæ on the segments of the endopod are as follows :

P 1.	P 2.	P 3.	P 4.	P 5.
1, 2, 5	1, 2, 8	1, 2, 8	1, 2, 7	1, 1, 6

In the 1st leg (Text-fig. 47, C) the 2nd basal segment carries a stout flagellum-like process near the outer distal angle ; this process is directed backwards, and very closely resembles that present in *Heterorhabdus spinifrons* and *H. abyssalis*. The rami very closely resemble those of *Disseta palumboi*, but the distal outer angles of all three segments of the endopod are produced in bluntly rounded lobes.

The 2nd–4th legs resemble those of *Disseta palumboi*, except as regards the much greater development of the epidermal glands ; the 2nd and 3rd segments of the exopod are crowded with glands, that open by numerous pores, as shown in Text-fig. 47, D–F. A gland is present in the 1st basal segment of these legs.

The 5th leg agrees with the figure given by Sars.

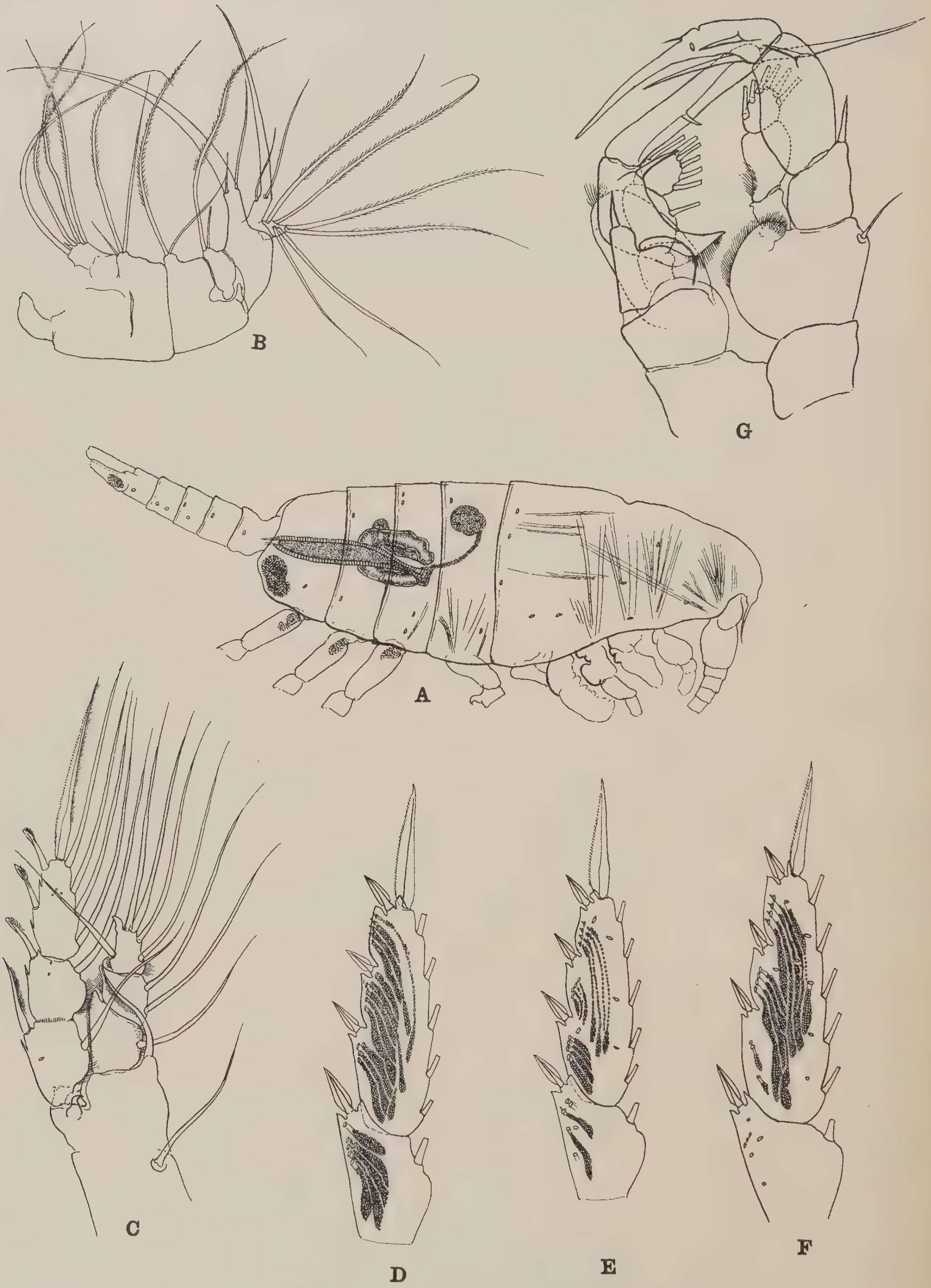
Associated with this female was a single adult male, that I have no doubt is the hitherto unknown male of this species.

♂. Total length, 6·717 mm.

The proportional lengths of the anterior and posterior regions of the body are as 66 to 34. The proportional lengths of the various segments are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
356	94	67	62	84	44	52	57	50	50	84 = 1000.

The left 1st antenna is modified into a grasping organ that very closely resembles that of *Heterorhabdus spinifrons* and *H. abyssalis*, even to the proportional lengths of the two segments preceding and following the hinge.



Text-fig. 47.—*Mesorhabdus angustus* Sars, ♂. A, Lateral view. B, 2nd maxilla. C, 1st leg. D, Exopods 2 and 3 of 2nd leg. E, Exopods 2 and 3 of 3rd leg. F, Exopods 2 and 3 of 4th leg. G, 5th pair of legs.

Species.	Segment 17.	Segment 18.	Segments 19–21.	Segments 22–23.
Heterorhabdus				
spinifrons	21	8	39	32
abyssalis	17	9	39	35
Mesorhabdus				
angustus	19	10	39	32

The 2nd antenna and mouth-parts resemble those of the female.

The swimming legs also resemble those of the female.

The 5th pair of legs (Text-fig. 47, G) are of the same general type as in *Heterorhabdus*. In the right leg the 2nd basal segment is produced in a large oval flap, that bears a tuft of hairs at its distal extremity. Both rami are three-jointed. The 1st segment of the exopod bears a stout marginal spine. The 2nd segment is produced inwards in a stout pointed process at its proximal end and bears a marginal spine distally. The 3rd segment bears a spine about the middle of its length, and terminally carries a long spine, as long as the segment itself. The 1st segment of the endopod is devoid of an inner seta, the 2nd segment bears one and the 3rd segment 6 long setæ. In the left leg the 2nd basal segment has a convex inner margin that is fringed with hairs in its distal two-thirds, and bears a delicate spine at its distal outer angle. The 1st segment of the exopod is produced at its distal outer angle and carries a stout spine. The 2nd segment is broadly oval in shape, and bears a spine at about the junction of the middle and distal thirds of its outer margin. The 3rd segment is long and tapers to a point; it bears a long spine, equal to half the length of the segment, close to the base, and a shorter stouter spine at about one-sixth of the length; about the middle of the outer margin there is a small delicate seta. The segments of the endopod on the right leg bear 0, 1, 6 setæ, and of the left 0, 0, 6 setæ.

DISTRIBUTION.—This species has now been recorded from the North Atlantic Ocean (Sars), the Arabian Sea (present record) and the Laccadive Sea (Sewell).

Genus *Disseta* Giesbrecht.

Disseta, Giesbrecht, 1892, p. 369; Giesbrecht and Schmeil, 1898, p. 112.

Disseta palumboi Giesbrecht. (Text-fig. 48, A–I.)

Disseta palumboi, Giesbrecht, 1892, p. 369, pl. xxix, figs. 2, 8, 14, 19, 23–25, 27, pl. xxxviii, fig. 44; A. Scott, 1909, p. 133, pl. xli, figs. 11–21; Sars, 1925, p. 221, pl. lx, figs. 1–14; Rose, M., 1929, p. 34, pl. ii, fig. 4; Sewell, 1932, p. 309, text-figs. 102, 103, *a–d*.

Heterorhabdus grandis, Wolfenden, 1904, p. 120, pl. ix, fig. 36; *idem*, 1905, p. 8, pl. iv, figs. 7, 8; van Breemen, 1908, pp. 126, 227, figs. 145, 243.

Disseta atlantica, Wolfenden, 1911, p. 313.

Disseta grandis (♀ only), Esterly, 1906, p. 72, pl. ix, fig. 21, pl. xi, figs. 45, 46, pl. xiii, fig. 69, pl. xiv, figs. 88, 94.

Disseta sp., Esterly, 1911, p. 331, pl. xxvii, figs. 40, 41, pl. xxx, figs. 76, 80, pl. xxxi, fig. 100, pl. xxxii, figs. 107, 108.

OCCURRENCE:

Sta. 76, Gulf of Oman, 600–0 m., 1 female.
Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female, 1 juv.
Sta. 131 D, Southern part of Arabian Sea, 1500–0 m., 3 females, 5 males.
Sta. 172, Central part of Arabian Sea, 850–0 m., 6 females, 5 males, 7 juv.

DESCRIPTIVE NOTES.—♀. Total length, 7·33–7·45 mm.

The proportional lengths of the anterior and posterior regions of the body are as 67 to 33. The proportional lengths of the various segments of the body are as follows :

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
(1)	275	129	84	92	88	111	63	52	33	73 (67)
(2)	269	136	78	95	85	111	66	58	29	82 (66)

The inequality of the two furcal rami was considerably more marked in the second specimen than in the first, as is shown by the figures given above. In a previous paper I have called attention to the integumentary glands that open by relatively large pores on the surface of the body and on certain of the appendages : in addition to these a gland composed of granular protoplasm is situated in the postero-lateral region of the combined 4th–5th thoracic segment (Text-fig. 47, A). The posterior angle of this segment is bluntly rounded.

The genital segment exhibits a rounded swelling in the dorso-lateral region. The segment is covered with numerous minute needle-like spinules in the posterior two-thirds of its length on the dorsal and lateral aspects. The posterior borders of the abdominal segments are fringed with needle-like spinules, those on the 4th segment being somewhat more coarse than the others.

The 1st antenna overreaches the tip of the furcal rami by 5 segments in one specimen and 5½ segments in the other. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	53	13	16	14	16	17	17	16	15	18	21	25	39	48	55	67	74	80	76	64	57	56	62	57	24 = 1000.

A comparison of these figures with those given for specimens from the Bay of Bengal (*vide* Sewell, 1932, p. 310) shows little difference. The demarcation between segments 8, 9 and 10 is quite clear, though perhaps not quite so complete as in the rest of the appendage. The 1st segment shows clearly the thickenings of the chitin, to which Giesbrecht drew attention (Text-fig. 47, B).

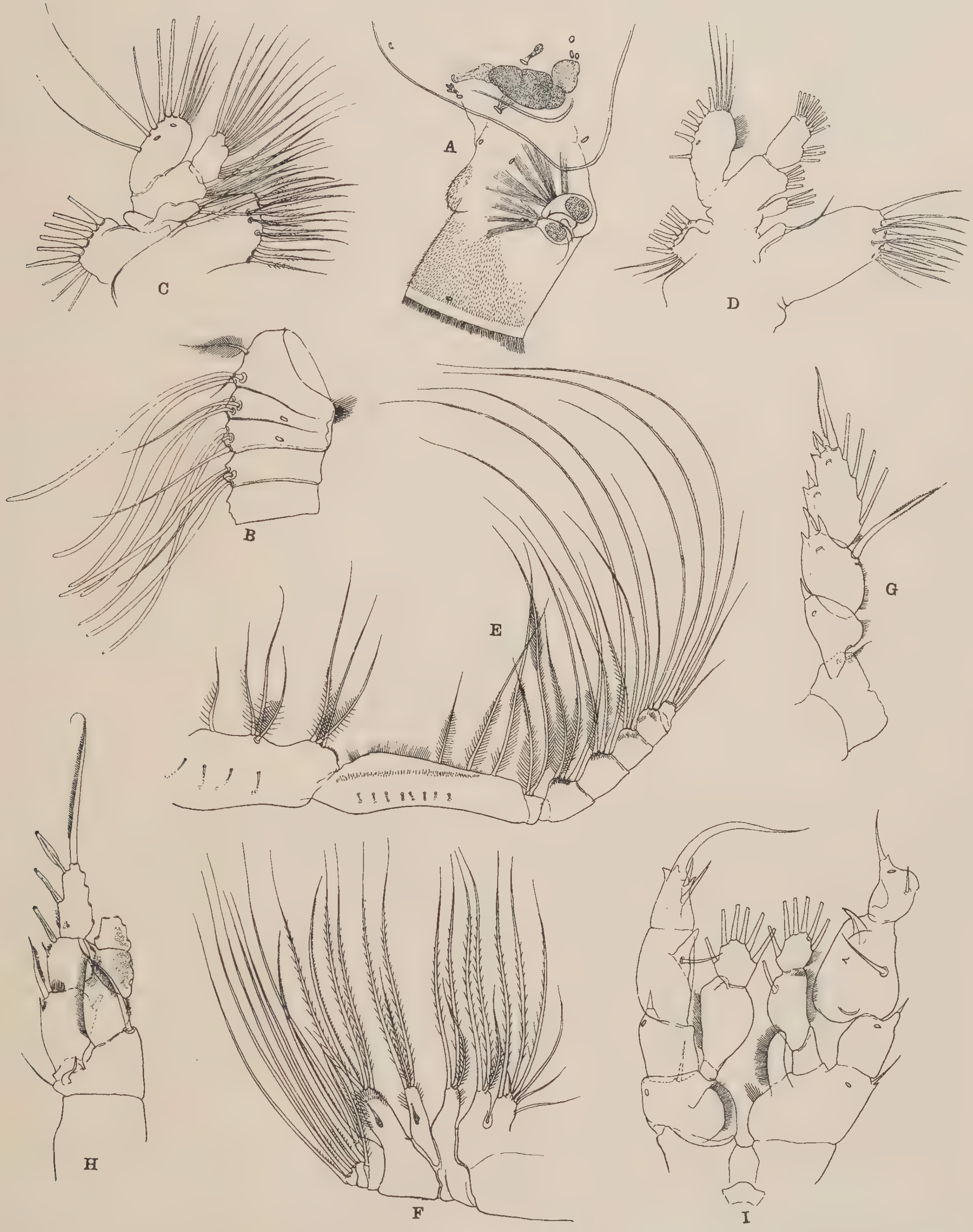
In the 2nd antenna the endopod is slightly longer than the exopod : Giesbrecht (1892, p. 370) states that the two rami are of approximately equal length, but in his figure he shows the endopod as being slightly the longer in the proportion of 42 to 35. In the present specimens they are 45 and 35 or 41 and 34 respectively. In its general structure the present specimens agree exactly with Giesbrecht's figure.

In the mandible the endopod is actually shorter than the exopod or of the same length, but owing to the method of articulation of the two rami, the endopod reaches far beyond the tip of the exopod, as is correctly shown by Giesbrecht (1892, pl. xxix, fig. 14).

In the 1st maxilla (Text-fig. 47, C) the various lobes bear the following number of setæ :

Li. I	14 spines or setæ.
Li. II . . .	1 seta.
Li. III . . .	3 setæ.
Basal 2 . . .	4 setæ.

Endopod . . .	3, 4 and 5 setæ on the three segments.
Exopod . . .	6 large and 5 smaller setæ.
Le. I . . .	3 small and 6 large setæ.



TEXT-FIG. 48.—*Disseta palumboi* Giesbrecht. A, Posterior thoracic margin and genital segment, ♀. B. Proximal three segments of 1st antenna, ♀. C, 1st maxilla, ♀. D, 1st maxilla, ♂. E, Maxilliped, ♀. F, 2nd maxilla, ♀. G, 5th leg, exopod, ♀. H, 1st leg, ♂. I, 5th pair of legs, ♂.

Wolfenden's claim that *D. atlantica* differs from *D. palumboi* in possessing 12 setæ on the endopod instead of 9 is invalid: Giesbrecht (1892, p. 370) gives the numbers of setæ on the three segments of the endopod as 3, 4 and 5 respectively, making 12 in all.

The 2nd maxilla and the maxilliped (Text-fig. 47, E, F) agree exactly with Wolfenden's account of the appendages in *D. atlantica*.

In the 1st leg (Text-fig. 47, H) the 2nd basal segment bears on its posterior aspect a slender delicate process that arises from a slightly swollen base; this structure appears to be identical with the process to which I have already called attention in the genera *Heterorhabdus*, *Hemirhabdus*, *Mesorhabdus*, *Heterostylites*, *Lucicutia*, *Pleuromamma* and *Metridia*.

Accompanying these females were several males.

♂. Total length 6·667–7·00 mm.

The proportional lengths of the anterior and posterior regions of the body are as 65 to 35. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
258	128	81	97	89	52	60	65	58	34	78 (58)

As Esterly (1911, p. 331) in his account of *Disseta* sp. from the San Diego Region has pointed out, the middle segment of the abdomen is the longest.

The 1st antenna is about the length of the body, and the proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
Right	53	16	17	16	17	17	17	17	17	17	22	24	42	48	50	58	66	77
Left	76		26	26	26	26	26	20	20	20	20	22	38	50	66	80	74	50

19–20.		21.	22.	23.	24.	25.	
73	62	58	58	67	62	29	= 1000.
107			129		68	30	= 1000.

The portion of the left antenna beyond the knee-joint is composed of four "segments," segments 19–20 and 21–23 respectively being fused. This agrees with Wolfenden's account of the grasping antenna in *D. atlantica*, and if the proportional lengths of these last five segments that he gives are recalculated, so as to correspond to the figures given above, the proportional lengths become 47, 112, 118, 59, 35, thus showing a very fair degree of agreement. Esterly also in his account of the form that he described under the name *D. grandis* states that the terminal portion of the grasping antenna is composed of four segments, but unfortunately he gives no measurements. On the other hand Rose (1929, pl. ii, fig. 4, L) shows seven segments in the terminal portion of the antenna in the specimen that he examined.

The 2nd antenna agrees with that of the female.

In the 1st maxilla (Text-fig. 47, D) the various lobes possess the same number of setæ as in the female, but a comparison of the two appendages shows that there is a slight difference in the character of the 1st inner lobe, which is not so strongly developed in the male as in the female.

The 2nd maxilla and maxilliped appear to agree with the female.

The first four pairs of legs resemble those of the female.

The 5th feet (Text-fig. 47, I) of the present specimens agree closely with the description and figures given by Wolfenden (1905, pl. iv, figs. 7, 8) for his *Heterorhabdus grandis*, by A. Scott (1909, pl. xli, fig. 21) and Rose (1929, pl. ii, fig. 4, p. 5) for *Disseta palumboi*, as well as with the description by Wolfenden (1911, p. 314) of the same appendage in *Disseta atlantica*, and Esterly's account and figure (1911, pl. xxxii, figs. 107, 108) of the appendage in his *Disseta* sp., and there can be little or no doubt that all these forms are synonymous. On the other hand the form of this appendage in Esterly's *Disseta grandis* (1906, pl. xiv, figs. 88, 94) and in my *D. palumboi* (1932, text-fig. 103, *c*, *d*) show certain differences, especially as regards the terminal segment of the exopod of the left leg, in which the terminal spine is much shorter.

REMARKS.—Farran (1906, p. 67) remarks, " Dr. Wolfenden's figures of *Heterorhabdus grandis* furnish unmistakable proof of the identity of that species with *Disseta palumboi*," but more recently he appears to have had some doubts on the subject, for he writes (1926, p. 279), " In 1911 Wolfenden redescribed, as it seems, the Atlantic form, which he had previously named *grandis*, as *D. atlantica* from specimens taken by the ' Gauss ' and pointed out some characters in which it differed from Giesbrecht's Pacific species." As I have mentioned above, some of Wolfenden's supposed differences are invalid, and I can see no grounds for separating the various females into Pacific and Atlantic forms or species. In the case of the males, however, I am not so certain: the form that Esterly (1906) described as the male of *D. grandis* and that I recorded (1932) from the Bay of Bengal does present certain slight differences, and it is possible that this is either a different species or possibly only an Indo-Pacific variety of the Atlantic form. The form that Esterly (1911) recorded under the name *D. maxima* is, in my opinion, a good species, and so also is Brady's *Leuckartia scopularis* (1883, p. 51, pl. xiv, figs. 1–5), which, as A. Scott (1909, p. 134) has pointed out, is in reality a *Disseta*. *Disseta maxima* is known only from the female, which measured 9·4 mm. in length, while *D. scopularis* is known only from the male, which has a length of 9·75 mm.; both were taken in the Pacific region, and it is possible that they are the two sexes of one species.

DISTRIBUTION.—*D. palumboi* appears to be a very widely distributed species, and if I am correct in my conclusion, it has been recorded from the west coast of Ireland (Wolfenden, Farran), the Bay of Biscay (Farran), the North Atlantic (Sars, Rose), the South Atlantic (Wolfenden), the Arabian Sea and Gulf of Oman (present records), the Bay of Bengal and Laccadive Sea (Sewell), the Malay Archipelago (A. Scott), the western Pacific Ocean (Giesbrecht), and the San Diego region of the Californian coast (Esterly).

Family AUGAPTILIDÆ.

Genus *Haloptilus* Giesbrecht.

Haloptilus, Giesbrecht, 1892, p. 384; Giesbrecht and Schmeil, 1898, p. 117.

In this genus the 2nd maxilla exhibits a considerable degree of variation in the number of setæ that arise from the different lobes in different species, as is shown in the following table:

Species.	Number of setæ arising from the lobes of the 2nd maxilla.					
	1.	2.	3.	4.	5.	6.
major Wolfenden	3	3	3	3	3	4
chierchiæ Giesbr. ? *fons* Farran	3	3	3	2	2	3
acutifrons Giesbr. *mucronatus* (Claus)	3	2	2	2	2	4
ornatus (Giesbr.) *validus* Sars	3	2	2	2	2	3
tenuis Farran	3	1	2	2	2	7 (?)

A comparison of the mouth-parts in the two sexes of several species in the genus reveals that there is a slight, though quite distinct, tendency for those of the male to be reduced. Giesbrecht (1892, p. 395) has already pointed this out, and remarks that the four appendages, mandible, 1st and 2nd maxilla and maxilliped, are in the male similar to those of the female, but are on the whole more feebly developed and are not so strongly armed. This he has noticed especially in *longicornis*, and he further notes that in *ornatus* the spines on the two short hooks of the 1st inner lobe of the 1st maxilla, which have a characteristic thickness in the female, are absent in the male. A comparison of the two sexes of *chierchiæ* reveals that here too there is a quite distinct reduction of the mouth-parts in the male, which is especially noticeable in the biting ramus of the mandible and in the 2nd maxilla.

Haloptilus acutifrons (Giesbrecht).

Hemicalanus acutifrons, Giesbrecht, 1892, p. 384, pl. iii, fig. 11, pl. xxvii, fig. 12, pl. xlii, figs. 12, 20.
Haloptilus acutifrons, Sars, 1901–03, p. 12, pl. lxxxii, fig. 2; *idem*, 1925, p. 250, pl. lxxiv, figs. 1–11.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 2000–0 m., 1 female.
Sta. 76, Gulf of Oman, 600–0 m., 1 female.

Distribution.—The Arctic Ocean (Sars, as *H. spinifrons*), the Norwegian Sea (Sars), in Baffin Bay and to the south of Davis Strait (Jespersen), the Irish coast (Farran), the Bay of Biscay (Farran), Mediterranean Sea (Giesbrecht), the North Atlantic Ocean (Sars, Farran), the Atlantic region of the Southern Ocean (T. Scott), the Arabian Sea and Gulf of Oman (present records), the Australian Barrier Reefs (Farran) and off New Zealand (Farran). (For details of the distribution of this species in the North Atlantic Ocean, see Jespersen, 1934, p. 111, fig. 28.)

Haloptilus chierchiæ (Giesbrecht). (Text-fig. 49, a–i.)

Hemicalanus chierchiæ, Giesbrecht, 1892, p. 384, pl. xxvii, figs. 16, 17, 25, pl. xlii, figs. 2, 27, 28.
Haloptilus chierchiæ, Sars, 1925, p. 245, pl. lxx, figs. 1–13.

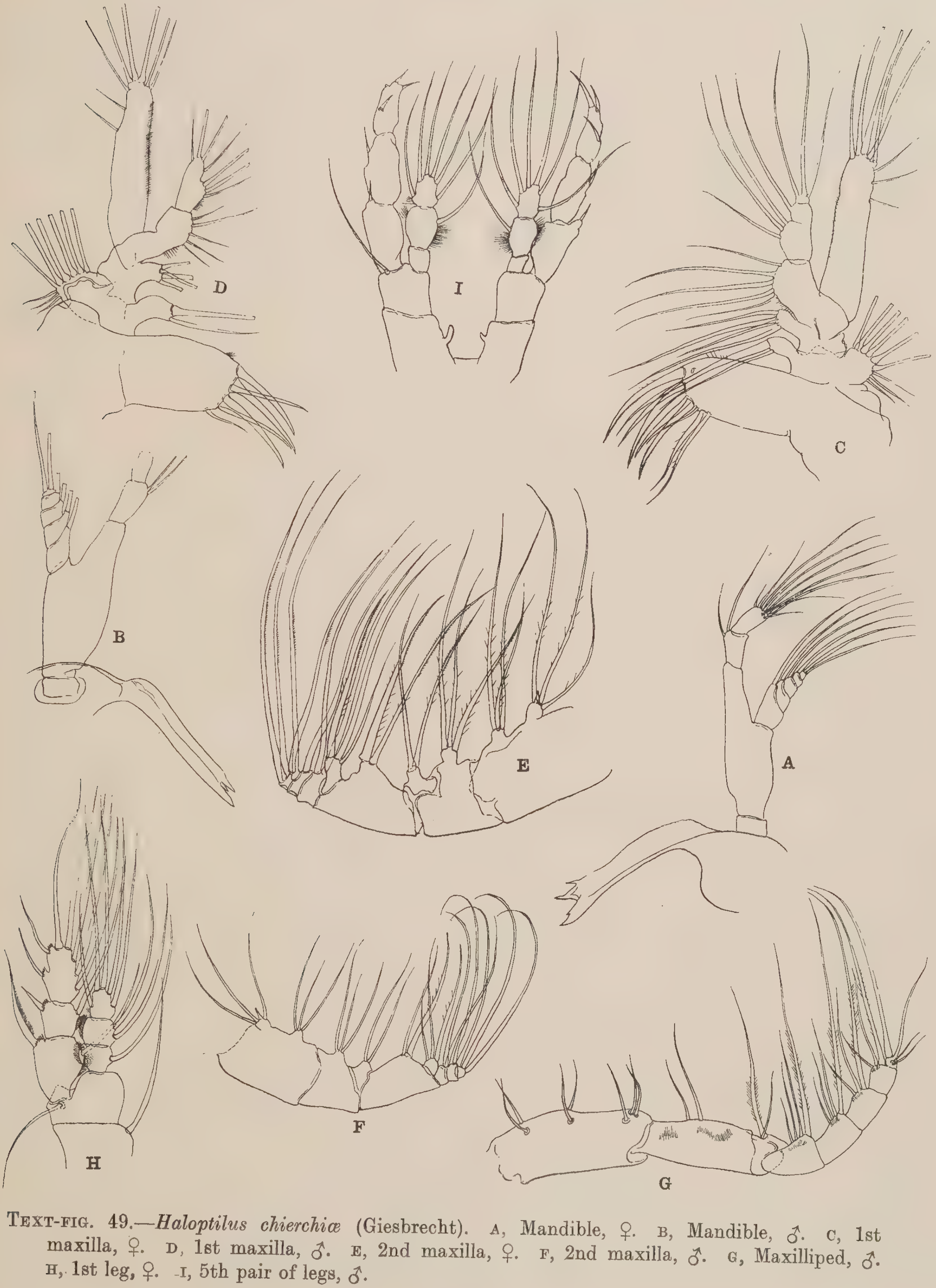
Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 59 females.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 26 females, 1 male.
Sta. 76, Gulf of Oman, 1500–0 m., 50 females, 2 males.

Sta. 145 C, Maldive area, 500–0 m. vertical, 1 female.

Sta. 172, Central area of Arabian Sea, 850–0 m., 2 females.

Descriptive Notes.—♀. Total length 4·6 to 4·8 mm.



Text-fig. 49.—*Haloptilus chierchiæ* (Giesbrecht). A, Mandible, ♀. B, Mandible, ♂. C, 1st maxilla, ♀. D, 1st maxilla, ♂. E, 2nd maxilla, ♀. F, 2nd maxilla, ♂. G, Maxilliped, ♂. H, 1st leg, ♀. I, 5th pair of legs, ♂.

The proportional lengths of the cephalothorax and abdomen are as 83 to 17. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
471	137	56	56	88	74	23	18	28	49 = 1000.

The separation of the cephalon and the 1st thoracic segment appears to be incomplete ; a line of demarcation is visible across the dorsum but disappears in the lateral region. Thoracic segments 4 and 5 are fused. The forehead is acutely rounded and is devoid of any crest. The posterior thoracic margin is rounded. The genital segment is longer than the three following segments together.

The 1st antenna overreaches the furcal rami by about the last 6 or 7 segments. The proportional lengths of the various segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	73	16	19	19	25	25	27	29	32	33	36	44	51	51	48	49	51	54

19.	20.	21.	22.	23.	24.	25.
44	39	44	44	57	53	37 = 1000.

Segments 7, 9, 12, 14, 18, 21, 23, 24 and 25 all bear long setæ. The distal seta on segment 8 is stout but very short.

The 2nd antenna and mouth-parts are as described and figured by Giesbrecht (1892), and Sars (1925).

The 1st leg (Text-fig. 49, H) agrees exactly with the figure given by Giesbrecht (1892, pl. xxvii, fig. 25) ; the distal outer angle of exopod 1, 2 and 3 at the base of the marginal spines is fringed with a comb of minute spinules.

Associated with these females were a few males.

♂. Total length, 4·05 mm.

The proportional lengths of the anterior and posterior regions of the body are as 80 to 20. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
437	146	74	61	94	45	29	20	16	29	49 = 1000.

The forehead is rounded and without any crest or prominence.

The right 1st antenna is modified to form a grasping organ. The proportional lengths of the various segments of the unmodified antenna differ somewhat from those of the female and are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	77	21	23	24	28	29	29	32	36	39	40	46	51	52	50	48	50	55

19.	20.	21.	22.	23.	24.	25.
45	35	38	38	45	45	24 = 1000.

In the right antenna the proportional lengths of the terminal six segments are as follows : 70, 71, 116, 71, 56 and 25. Segment 17 bears distally a horizontal spine that projects over the proximal third of segment 18. Segment 18 bears a horizontal spine that arises at the junction of about the middle and distal thirds and nearly reaches the end of the segment. The portion beyond the joint, representing segments 19–21, bears two spines; the proximal arises near the proximal end of the segment and projects to about half the length; the distal spine arises near the junction of the proximal and middle thirds of the segment and reaches the distal end. The combined segment 22–23 bears distally a long straight spine that extends to the end of the appendage.

The 2nd antenna closely resembles that of the female, the exopod being very short and composed of 8 segments; segments 1 and 2 are clearly separate.

The 1st and 2nd maxillæ differ somewhat from those of the female.

In the 1st maxilla (Text-fig. 49, D) the number of spines on the 1st inner lobe is reduced; in the female there are 7 spines and in addition a delicate seta, whereas in the male there are only 5 spines and one seta: furthermore, in the endopod the segments are fused in the male, whereas in the female the 1st and 2nd segments are separate and a trace of separation of the 3rd segment can be detected.

The 2nd maxilla (Text-fig. 49, F) is less developed than in the female, as Giesbrecht has noted, and the setæ are shorter and more delicate, a condition that is especially noticeable in the spines arising from the 5th and 6th lobes.

In the maxilliped (Text-fig. 49, G) the spines arising from the various lobes are much more delicate than in the female, and the 2nd lobe bears only 2 setæ, instead of 3.

The swimming legs agree closely with those of the female, but in the 1st leg the combs of fine spinules at the base of the marginal spines on the segments of the exopod are absent.

In the 5th leg (Text-fig. 49, I) the appendages of the two sides are very nearly symmetrical. Each ramus is composed of three segments. In the right leg the 1st basal segment carries on its inner margin a blunt process. The 2nd basal bears a single seta. Exopods 1 and 2 each bear a somewhat delicate marginal spine, and exopod 3 bears two spines on the outer margin and one distally. In the left leg basal 1 bears a blunt small process on its inner margin. Basal 2 possesses a single seta. Exopods 1 and 2 each bear a delicate marginal spine and exopod 3 bears 3 spines. There are no inner setæ on any of the segments of the exopod in either leg. In both legs the 1st segment of the endopod is devoid of a seta, endopod 2 bears a single one, and endopod 3 bears 6 setæ.

DISTRIBUTION.—This species has now been recorded from the North Atlantic Ocean near the Canary Islands and the Azores (Sars), the tropical Atlantic region (Wolfenden), the northern area of the Arabian Sea, the Gulf of Oman and the Maldive area (present records), the Laccadive Sea (Sewell), and the Pacific Ocean (Giesbrecht, Sars).

Haloptilus mucronatus (Claus).

Hemicalanus mucronatus, Giesbrecht, 1892, p. 384, pl. iii, fig. 10, pl. xxvii, figs. 11, 13, 19, pl. xlii, figs. 4, 6, 13, 14.

Haloptilus mucronatus, Sars, 1925, p. 249, pl. lxxiii, figs. 11–15.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 1 female.

DISTRIBUTION.—In the Mediterranean Sea (Claus, Sars), the North Atlantic Ocean (Sars), the Gulf of Guinea (T. Scott), the Arabian Sea (present record), the Australian Barrier Reefs (Farran), and off New Zealand (Farran).

Haloptilus ornatus (Giesbrecht). (Text-fig. 50, H.)

Hemicalanus ornatus, Giesbrecht, 1892, p. 384, pl. xxvii, figs. 1, 6, 7, 21, 28; pl. xlii, figs. 1, 9, 19.
Haloptilus ornatus, Sars, 1925, p. 247, pl. lxxiii, figs. 1–5.

Occurrence:

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 2 females.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Remarks.—The total length of these specimens ranged from 4·4 to 4·5 mm.; they are thus slightly smaller than Sars' examples from the North Atlantic Ocean, which measured 5·0 mm., and those of Giesbrecht from the Mediterranean Sea, which were 4·6 to 4·8 mm.

Distribution.—The North Atlantic Ocean (Thompson, Sars, van Breemen), the Mediterranean Sea (Giesbrecht), the South Atlantic Ocean (Wolfenden), the Arabian Sea (present records), the Laccadive Sea (Sewell) and the Malay Archipelago (A. Scott).

Haloptilus oxycephalus (Giesbrecht).

Hemicalanus oxycephalus, Giesbrecht, 1892, p. 384, pl. xlii, figs. 7, 16.
Haloptilus oxycephalus, Sars, 1925, p. 252, pl. lxxiv, figs. 12–16.

Occurrence:

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Distribution.—The Mediterranean Sea (Sars), South-east of Madagascar in the Indian Ocean (Wolfenden), the Arabian Sea (present records), and to the South of New Zealand and in the Antarctic Ocean (Farran).

Haloptilus validus Sars. (Text-fig. 50, A–G.)

Haloptilus validus, Sars, 1925, p. 241, pl. lxviii, figs. 1–14.

Occurrence:

Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

♀. Total length 6·0 mm.

The proportional lengths of the anterior and posterior regions of the body are as 85·5 to 14·5. The proportional lengths of the various segments of the body are as follows:

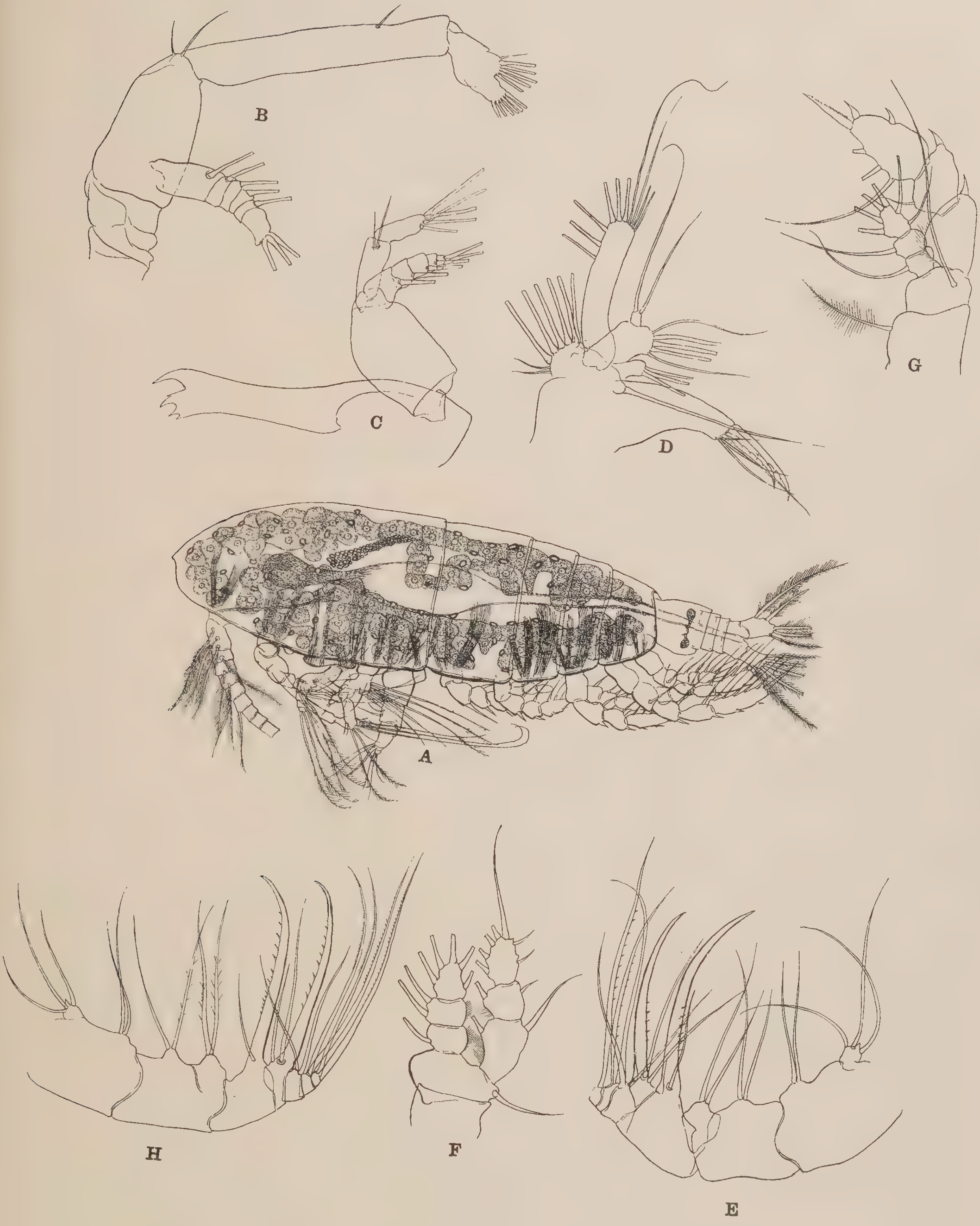
Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
501	131	75	67	83	56	16	8	21	42 = 1000.

The forehead is produced in a small spinous projection. The posterior thoracic margins are bluntly rounded.

The 1st antenna overreaches the tip of the furcal ramus by about the last two segments. The proportional lengths of the various segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
75	15	17	17	18	21	22	23	29	29	35	45	54	60	62	66	66	65	59	47	44	40	38	31	23 = 1000.

The proximal segments are provided with long plumose setæ.



TEXT-FIG. 50.—*Haloptilus validus* Sars, ♀. A, Lateral view. B, 2nd antenna. C, Mandible. D, 1st maxilla. E, 2nd maxilla. F, 1st leg. G, 5th leg. *Haloptilus ornatus* (Giesbrecht), ♀. H, 2nd maxilla.

In the 2nd antenna (Text-fig. 50, B) the exopod is less than half the length of the endopod. It appears to be composed of only 6 segments, of which the 1st is nearly equal in length to the rest of the appendage.

The mandible (Text-fig. 50, C) is of the same general type as that of *H. chierchiæ.*

In the 1st maxilla (Text-fig. 50, D) the biting ramus tapers towards the distal end and bears only two stout serrated teeth and 4 delicate setæ. The 2nd inner lobe is small and rounded and bears a single long seta. The 3rd inner lobe bears 3 setæ. The 2nd basal segment bears 5 setæ, and the endopod is much reduced and forms a small rounded lobe bearing only two setæ. The endopod is long and comparatively slender and bears 10 setæ, of which the proximal 6 are well developed and the distal 4 are small and delicate. The outer lobe bears 3 very delicate proximal setæ and 6 well-developed distal ones.

The 2nd maxilla (Text-fig. 50, E) resembles that of *H. ornatus.* The 1st lobe bears 3 setæ and is produced in a small pointer process. Lobes 2, 3 and 4 each bear 2 setæ ; the 5th lobe bears one seta and a stout serrated spine. Lobe 6 bears a stout serrated spine and 2 setæ.

The swimming legs resemble those of other members of the genus.

In the 5th leg (Text-fig. 50, G) the 2nd basal segment bears externally a delicate seta that reaches the distal end of the exopod.

DISTRIBUTION.—This species has, up to the present time, only been recorded from the North Atlantic Ocean (Sars). The present record extends its range to the Arabian Sea.

Genus *Euaugaptilus* Sars.

Euaugaptilus, Sars, 1925, p. 260 ; Sewell, 1932, p. 313.

As Sars (1925, p. 260) has pointed out, the members of this genus differ from *Augaptilus* (*sensu stricto*) in the better development of the mandible and 1st maxilla, but that in the latter appendage there is a great deal of variability, which thus provides excellent specific characters. In a previous paper (1932, p. 312) I pointed out that the genus can be subdivided into groups in accordance with the degree of suppression found in the mandible, and especially in the 1st maxilla. Throughout the genus there is also a gradual reduction in the number of setæ that arise from the various lobes of the 2nd maxilla, so that this character also can be utilized for the further separation of species ; and finally certain species possess rows of small button-like projections on the terminal setæ of the 2nd maxilla and the maxilliped. Farran (1906, p. 71) has pointed out that " it is impossible to use any arrangement which does not separate species which in some points closely resemble each other." Since my account was published, further investigation has rendered it necessary to subdivide some of the groups into sub-groups.

GROUP I :

The mandibular palp possesses two well-developed rami.

A. The maxilla is of normal type, the endopod and inner lobes 1, 2 and 3 all present ; in *indicus* the endopod is greatly reduced and bears only a single seta :

(*a*) 8 segments in the exopod of the 2nd antenna.
Euaugaptilus nodifrons Sars.
E. indicus Sewell.

(*b*) 7 segments in the exopod of the 2nd antenna.

Euaugaptilus elongatus Sars.
E. farrani Sars.
E. maxillaris Sars.

(*c*) 6 segments in the exopod of the 2nd antenna.

? *Euaugaptilus simplex* Wolfenden.

B. In the 1st maxilla inner lobes 1 and 3 are present, but lobe 2 has been suppressed; the endopod is present.

Euaugaptilus humilis Farran.

C. Inner lobes 2 and 3 are suppressed; but an endopod is still present.

Euaugaptilus penicillatus Sars.

GROUP II:

In the 1st maxilla inner lobes 1, 2 and 3 are all present, but the endopod is wanting. The mandibular palp possesses two rami.

(*a*) 8 segments in the exopod of the 2nd antenna.

Euaugaptilus fungiferus Steuer.
E. grandicornis Sars.
E. laticeps Sars (= *placitus* A. Scott).
E. squamatus (Giesbrecht).
E. sub-filigerus (Wolfenden).

(*b*) 7 segments in exopod of 2nd antenna.

? *Euaugaptilus antarcticus* (Wolfenden) (? = *laticeps*).
E. filigerus (Claus).
E. magnus (Wolfenden).
E. oblongus Sars.
E. rostratus Esterly.
E. tenuispinus Sars.

GROUP III:

In the 1st maxilla inner lobes 1 and 2 are present; lobe 3 and the endopod are missing.

A. The mandibular palp possesses two rami.

(*a*) 8 segments in the exopod of the 2nd antenna.

Euaugaptilus affinis Sars.
E. angustus Sars.
E. facilis (Farran).
E. gracilis Sars.
E. propinquus Sars.
E. palumboi (Giesbrecht).

(*b*) 7 segments in the exopod of the 2nd antenna.

Euaugaptilus digitatus Sars.

(*c*) 4 segments only in the exopod of the 2nd antenna.

Euaugaptilus clavatus Sars.
E. gibbus Wolfenden.

B. The mandibular palp bears a normal exopod, but the endopod is much reduced.

Euaugaptilus longimanus Sars.

C. The mandibular palp bears only a single, much reduced ramus.

Euaugaptilus longicirrhus Sars.

GROUP IV:

In the 1st maxilla inner lobes 2 and 3 and the endopod are absent; inner lobe 1 is considerably reduced and bears only 2–5 setæ.

A. The endopod of the mandibular palp is present but may be much reduced.

(*a*) 8 segments in the exopod of the 2nd antenna.

Euaugaptilus bullifer (Giesbrecht).
E. truncatus Sars.

(*b*) 7 segments in the exopod of the 2nd antenna.

Euaugaptilus vicinus Sars.

B. The endopod of the mandibular palp is absent or is represented only by a single seta. 8 segments in the exopod of the 2nd antenna.

Euaugaptilus hecticus (Giesbrecht).
E. latifrons Sars.
E. rigidus Sars.
E. tenuicaudis Sars.

Throughout the whole genus there is a tendency for the number of setæ arising from the lobes of the 2nd maxilla to be reduced; this reduction reaches its climax in the species belonging to Group IV, as is clearly seen in the following table:

GROUP I:

A.

	Number of setæ on the lobes of the 2nd maxilla.					
Lobes:	1.	2.	3.	4.	5.	6.
Euaugaptilus nodifrons .	3 (+1)	3	3	3	3	4
E. indicus . . .	3 (+1)	3	3	3	3	3
E. simplex . . .	—	2	3	3	3	4 (? 3)*
E. maxillaris . . .	3	2	2	3	2	3
E. farrani . . .	—	2	2	3	2	3
E. elongatus . . .	3 (+1)	2	2	3	2	3

[*] Wolfenden (1911, p. 346) states that there are 4 setæ on this lobe, but he only figures 3 (*vide* fig. 76*b*).

Group I—(*contd.*):

	Number of setæ on the lobes of the 2nd maxilla.					
Lobes:	1.	2.	3.	4.	5.	6.
B.						
E. humilis	3	2	2	3	2	3
C.						
E. penicillatus	2	1	2	3	3	3
Group II:						
E. laticeps *E. tenuispinus* *E. squamatus*	3 (+1)	2	2	3	2	3
E. antarcticus	—	2	2	3	2	3*
E. magnus *E. oblongus* *E. fungiferus* *E. sub-filigerus*	3 (+1)	1	2	3	2	3
E. filigerus	1	1	2	3	2	3
Group III:						
E. digitatus *E. grandicornis* *E. gibbus*	3	2	2	3	2	3
E. facilis	3	2	2	3	2	3 or 2
E. clavatus	3	2	2	3	3	1
E. palumboi	3	2	2	3	2	1
E. gracilis	3	1	2	3	2	3
E. angustus	2	2	2	2	2	3
E. affinis	2	1	2	3	2	1
E. propinquus	2	1	2	2	2	1
E. sp. juv.	0	2	2	3	2	3
E. longicirrhus	0	1	2	3	3	3
Group IV:						
A.						
E. truncatus	2	1	2	3	2	3 (?)
E. bullifer	2	1	2	3	2	1
E. longimanus	1	1	1	3	2	3
E. vicinus	0	1	2	3	2	1
B.						
E. tenuicaudis	2	1	2	2	2	1
E. rigidus	2	1	1	2	2	1
E. latifrons	1	0	1	2	2	3
E. hecticus	0	0	1	2	2	1

---

* In the text Wolfenden (1911, p. 335) states that the 2nd and 4th–6th lobes bear 2, 2, 3, 2 setæ, but in his figure (pl. xxxvi, fig. 7) he shows the number of setæ given here.

In a genus in which there is so much variation in the structure of the mouth-parts, it is only to be expected that some variation should also be found in the 2nd antenna. In certain species that I believe to be synonymous, such as *Euaugaptilus nodifrons* and *simplex* and *Euaugaptilus laticeps* and *antarcticus* respectively, the number of segments in the exopod are stated to be 8 and 6 in the first pair and 8 and 7 in the second respectively. In *Euaugaptilus elongatus* this ramus is stated to possess 7 segments, but in the present example there are eight present, though the separation between the 1st and 2nd segments is not quite complete : similarly in *Euaugaptilus laticeps* there are stated to be 8 segments, whereas in *E. antarcticus* Wolfenden states that there are only 7, but in the present specimen the separation between segments 7 and 8 is incomplete on one aspect of the ramus.

There is in the genus a certain amount of variation in the segmentation of the swimming legs and also in the number of setæ arising from certain joints. In the great majority of species the setal formula for these legs is as follows :

	Endopod.			Exopod.		
	1.	2.	3.	1.	2.	3.
P 1	1	2	5	1	1	4, 1, 3
P 2	1	2	7	1	1	5, 1, 3
P 3	1	2	8	1	1	5, 1, 3
P 4	1	2	7	1	1	5, 1, 3
P 5	1	1	6	0	1	3, 1, 2

This formula is found in

Euaugaptilis nodifrons (= *simplex*).
E. elongatus.
E. maxillaris.
E. laticeps (= *antarcticus*, *placitus*).
E. squamatus.
E. filigerus.
E. magnus.
E. oblongus.
E. tenuispinus.
E. facilis.
Euaugaptilus gracilis.
E. gibbus.
E. propinquus.
E. bullifer.
E. digitatus.
E. penicillatus.
E. truncatus.
E. laticeps.
E. vicinus.
E. rigidus.

In two species, namely, *Euaugaptilus angustus* and *E. grandicornis*, the 3rd segment of the endopod of the 2nd leg bears only 6 setæ instead of 7. In *E. clavatus* the terminal segment of the endopod of the 1st leg bears only 4, instead of 5 setæ. In *E. longimanus* the 2nd segment of the endopod of the 1st leg bears only a single seta instead of two. In *E. longicaudatus*, *E. longimanus* and *E. affinis* the 3rd segment of the endopod of the 3rd leg bears 7, instead of 8, setæ.

In five species, namely—

Euaugaptilus latifrons,
E. farrani,
E. longicirrhus,
E. tenuicaudis,
E. palumboi,

the endopod of the 1st leg consists of only two segments instead of the usual three, and in *longicirrhus* the exopod has undergone the same reduction. In three of these species, *latifrons*, *palumboi* and *farrani*, the number of setæ arising from the endopod of the 2nd leg is normal, namely 1, 2, 7 ; and in *longicirrhus* and *tenuicaudis* there is only one seta on the 2nd segment, the formula being 1, 1, 7, instead of 1, 2, 7. In *E. palumboi* the 3rd segment of the endopod of the 5th leg bears only 5 setæ instead of 6, and in *E. tenuicauda* the distal two segments of this ramus are fused into one, though the number of setæ remains unchanged, so that the formula is 1, 6, instead of 1, 1, 5.

The various species can further be separated into two groups by the presence or absence of an external marginal seta on the 2nd basal segment of the 1st swimming leg. Such a seta has been recorded in the following species :

Euaugaptilus angustus.
E. bullifer.
E. cornutus.
E. elongatus.
E. facilis.
E. filigerus.
E. gibber.
Euaugaptilus grandicornis.
E. indicus.
E. longicirrhus.
E. longimanus.
E. nodifrons.
E. tenuispinus.

It is absent in the following species :

Euaugaptilus fungiferus.
E. laticeps.
E. latifrons.
Euaugaptilus magnus.
E. oblongus.

Group I.

Three species that I include in this group were present in the collection, *Euaugaptilus nodifrons* Sars, *E. indicus* Sewell, and *E. elongatus* Sars. As Farran (1906, p. 71) has pointed out, " *Augaptilus elongatus* is apparently the most primitive form, and in it, as also in *A. nodifrons*, the endopodite of the maxilla is indicated as a distinct joint, thus forming a link with the genus *Haloptilus*."

A third species which may be regarded as an aberrant member of this group, *E. penicillatus* Sars, was also present in the collection : in this species the endopod of the 1st maxilla is present, but both 2nd and 3rd inner lobes have been suppressed.

Euaugaptilus indicus Sewell. (Text-fig. 51, A–C.)

Euaugaptilus indicus, Sewell, 1932, p. 319, text-fig. 105, *a–j*.

Occurrence.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 juv.

Descriptive Notes.—The single specimen was in the fifth Copepodid stage.

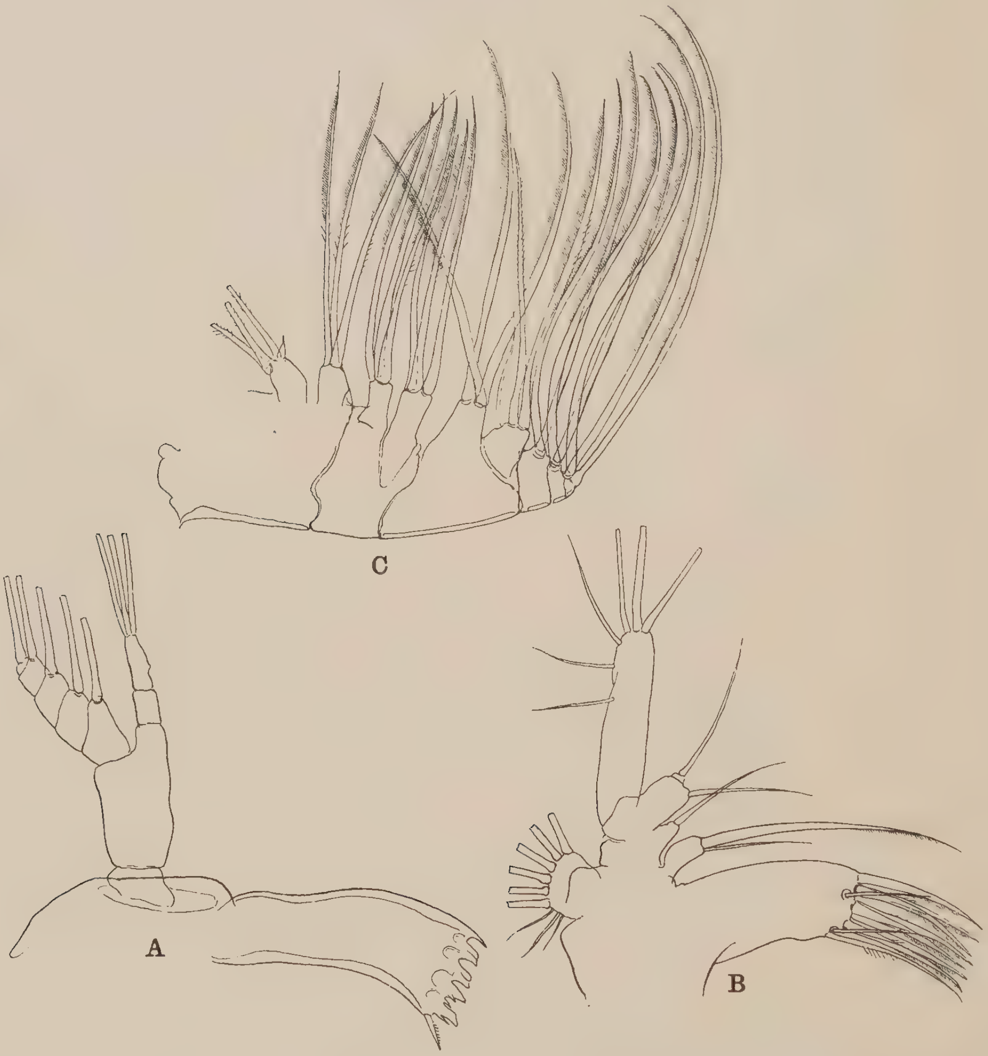
Stage V : ♀. Total length, 6·47 mm.

The proportional lengths of the anterior and posterior regions of the body are as 75 to 24, as compared with 78 to 22 in the adult. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
437	103	67	64	85	51	26	28	72	67 = 1000.

In the 1st antenna the proportional lengths of the segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
Stage V	75	18	21	21	25	25	25	23	25	29	43	41	50	50	50	50	55	55	58	45	46	48	58	48	25 = 1000.
Adult	67	10	22	22	22	22	24	26	29	31	34	45	50	53	54	56	56	56	57	46	46	42	50	48	25 = 1000.



Text-fig. 51.—*Euaugaptilus indicus* Sewell; Stage V, ♀. A, Mandible. B, 1st maxilla. C, 2nd maxilla.

The 2nd antenna resembles that of the adult.

In the mandible (Text-fig. 51, A) the biting ramus is as figured. The exopod consists of 5 segments, each of which bears a single stout seta; the endopod is composed of two segments, of which the distal bears three setæ.

In the 1st maxilla (Text-fig. 51, B) the 1st inner or biting lobe bears 7 stout spines and 3 more delicate ones; the 2nd inner lobe bears 2 unequal setæ and the 3rd lobe carries a single seta. The 2nd basal segment in the present specimen bears 1 seta, and the endopod is represented by a small raised lobe on the distal margin that bears a single seta.

The 2nd maxilla (Text-fig. 51, C) is well developed and the various lobes bear the following spine-like setæ: lobe 1, 3 setæ and an additional, small pointed process; lobe 2, 3 setæ; lobe 3, 3 setæ; lobe 4, 3 setæ; lobe 5, 3 setæ; lobe 6, two large setæ and 1 smaller one. The terminal three segments of the endopod bear 7 setæ. None of these setæ are provided with "buttons."

The maxilliped is well developed, but the various lobes have not yet assumed their full complement of setæ. The 1st basal segment bears 2, 3 and 3 setæ on the three lobes; the 2nd basal bears 2 and 2 setæ; the five segments of the endopod bear 3, 3, 2, 2 and 1 large setæ, and the distal segment also carries 4 small setæ.

The 1st–4th swimming legs are as in the adult. The 5th pair of legs possess only two segments in the rami.

DISTRIBUTION.—Up to the present time this species has been recorded from the Laccadive Sea (Sewell) and the Arabian Sea (present record).

Euaugaptilus elongatus Sars. (Text-fig. 52, A–F.)

Augaptilus elongatus, Farran, 1906, p. 71.
Euaugaptilus elongatus, Sars, 1925, p. 270, pl. lxxxiv, figs. 1–13.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

DESCRIPTIVE NOTES.—♀. Total length 5·00 mm.

The proportional lengths of the anterior and posterior regions of the body are as 70 to 30. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–3.	Abd. 4.	Abd. 5.	Furca.
408	122	61	46	70	119	43	51	80 = 1000

The 1st antenna overreaches the tip of the furcal ramus by the last five or six segments. The proportional lengths of the individual segments are as follows:

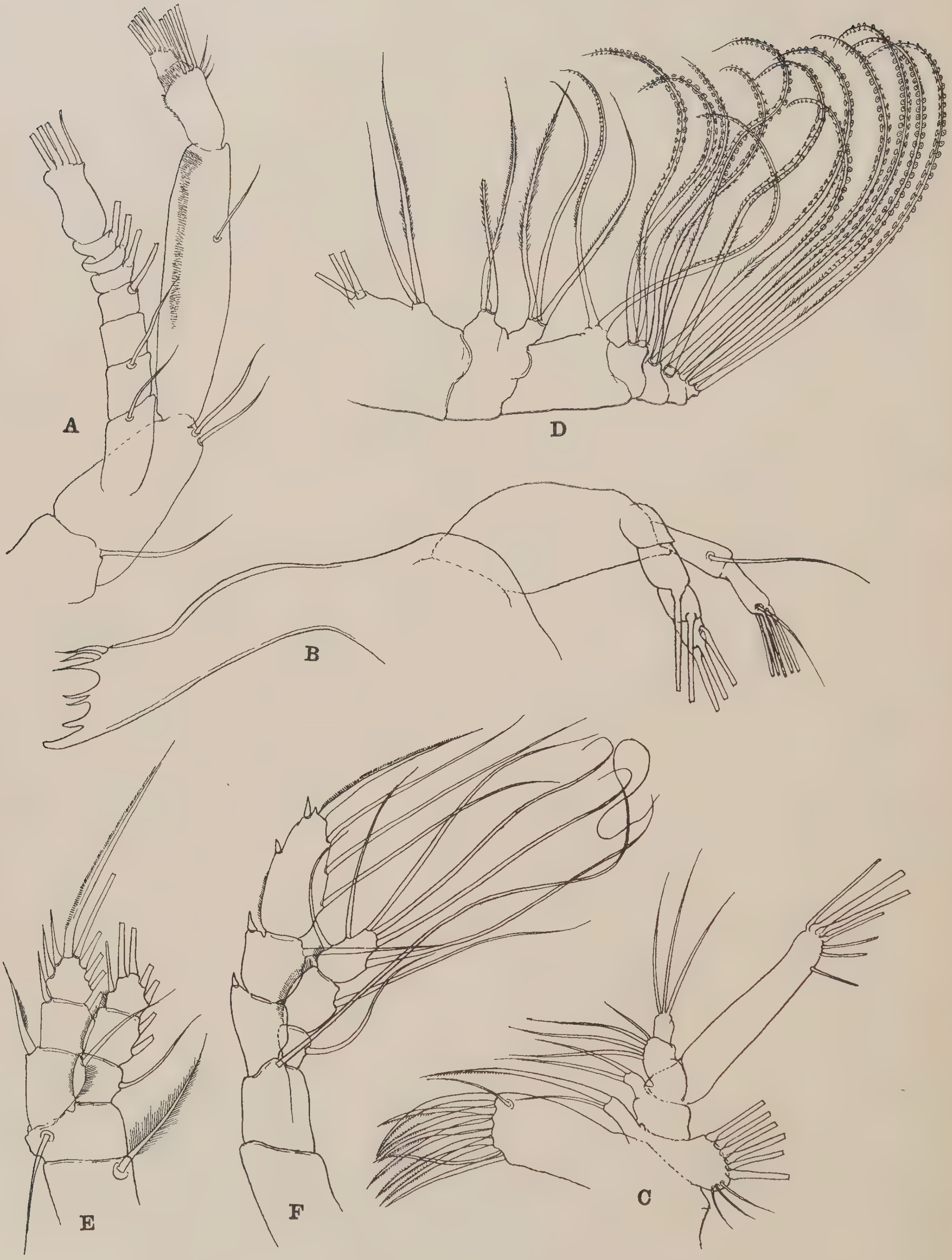
Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18	19.	20.	21.	22.	23.	24.	25.
	64	15	20	21	24	24	25	25	26	27	30	39	46	49	51	53	59	61	58	47	51	52	54	44	35 = 1000

In the 2nd antenna (Text-fig. 52, A) the endopod and exopod are of approximately equal length. The exopod is composed of eight segments; the 3rd segment appears to be devoid of a seta.

The mandible (Text-fig. 52, B) possesses a well-developed palp, the two rami being of approximately equal length. The biting ramus is well developed, but the biting edge is much more oblique than in either *nodifrons* or *indicus;* the teeth are arranged in three groups, possessing 2, 2 and 3 teeth respectively.

The 1st maxilla (Text-fig. 52, C) agrees with the description given by Farran (1906), but on the right side the 2nd basal segment bears 4, instead of 3, setæ.

In both the 2nd maxilla (Text-fig. 52, D) and the maxilliped the distal setæ are fringed



Text-fig. 52.—*Euaugaptilus elongatus* Sars, ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, 2nd maxilla. E, 1st leg. F, 5th leg.

with large " buttons," and in each seta one can trace a gradual transition from hairs, through small spines to " buttons."

In the 1st leg (Text-fig. 52, E) the 2nd basal segment bears a retroverted seta near the distal outer angle.

In the 5th leg (Text-fig. 52, F) the 2nd basal segment bears an extremely long, delicate seta, the total length of which is about twice the length of the exopod.

Distribution.—Up to the present time this species has only been recorded from the North Atlantic Ocean (Sars, to the south of Davis Strait), Baffin Bay and the south-west of Iceland (Jespersen), and the west coast of Ireland (Farran). The present record extends its distribution to the Indian Ocean, Arabian Sea.

Euaugaptilus nodifrons Sars. (Text-fig. 53, A–E.)

Euaugaptilus nodifrons, Sars, 1925, p. 267, pl. lxxxii; Sewell, 1932, p. 316, text-fig. 104, *a–j*.
? *Augaptilus simplex*, Wolfenden, 1911, p. 345, text-fig. 76.

Occurrence:

Sta. 61 A, Northern part of Arabian Sea, 1000–0 m., 12 specimens; 1500–0 m., 22 specimens.
Sta. 61 C, Northern part of Arabian Sea, 1500–0 m., 17 specimens.
Sta. 76, Gulf of Oman, 1500–0 m., 2 females.
Sta. 96, Central part of Arabian Sea, 635–400 m., 2 females, 1 male.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m. vertical, 1 female.
Sta. 172, Central area of Arabian Sea, 200–0 m., 2 females; 850–0 m., 1 female.

Remarks.—The form described by Wolfenden (*loc. cit.*) under the name *Augaptilus simplex* resembles *E. nodifrons* extremely closely. Almost the only point of difference that I can detect in Wolfenden's account is that lobe 6 of the 2nd maxilla is stated to possess four setæ; he, however (fig. 76, *b*), shows only two large setæ and one smaller one, and in *nodifrons* there are only two large setæ in addition to the smaller one.

In one of the present specimens the exopod of the 3rd leg (Text-fig. 53, E) showed an unusual modification; from the outer margin of the 2nd segment there arose a plumose seta situated about the middle of the length and from the distal angle the usual short spine; in exopod 3 the 1st and the 3rd marginal spines were doubled, so that, in all, 5 spines sprang from this margin. The terminal spine was much shorter than the normal spine on the other leg and was like a seta in shape.

Distribution.—The North Atlantic Ocean (Sars), the coast of Ireland (Farran), the South Atlantic (Wolfenden), the Arabian Sea and Gulf of Oman (present records), and the Laccadive Sea (Sewell). If *E. simplex* (Esterly) is, as I suspect, a synonym, then the distribution extends to the eastern Pacific Ocean.

Euaugaptilus penicillatus Sars.

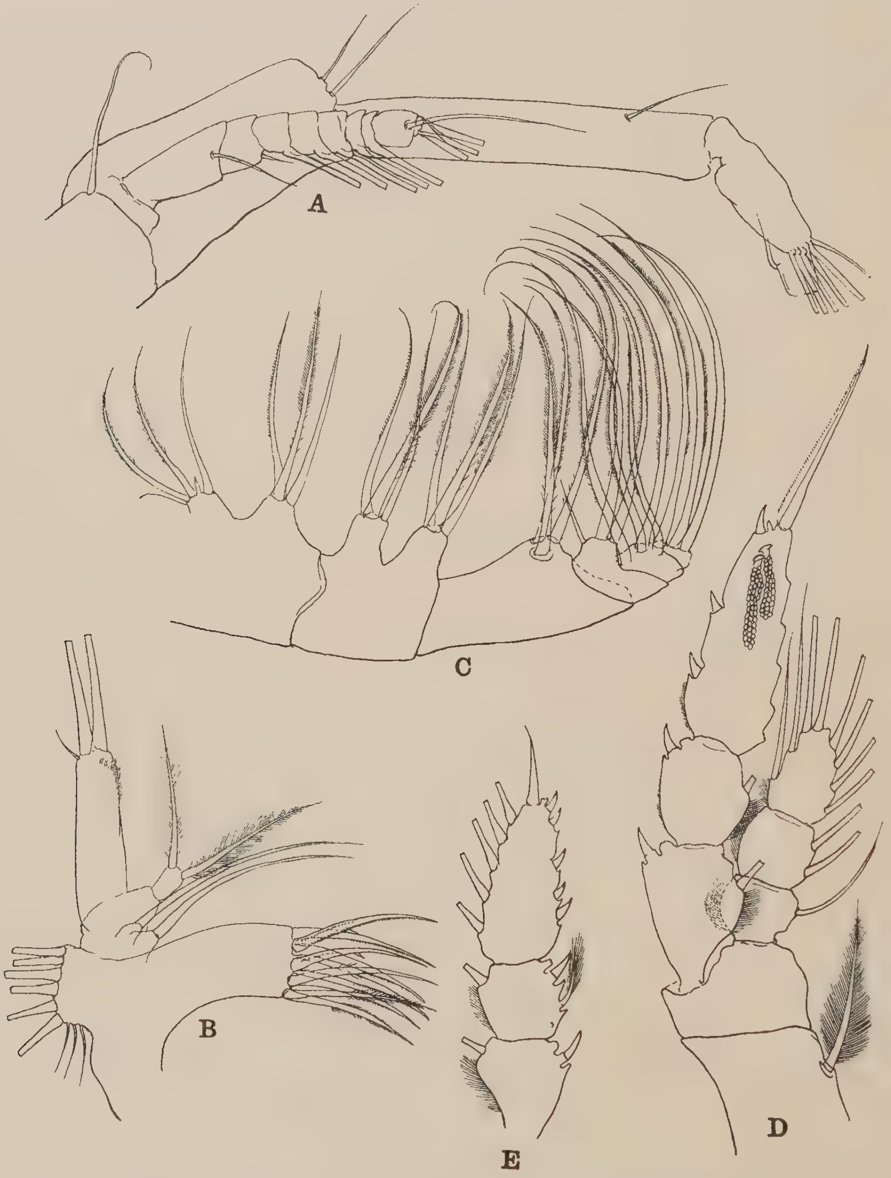
Euaugaptilus penicillatus, Sars, 1925, p. 294, pl. c, figs. 1–15.

Occurrence.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.

Distribution.—This species was originally taken in the North Atlantic to the west of Gibraltar (Sars). It has since been taken on the west of Greenland (Jespersen). The present record extends its distribution to the Arabian Sea.

Group II.

Four species, that I include in this group, are present, namely, *Euaugaptilus laticeps*, *E. magnus*, *E. oblongus* and *E. tenuispinus*. In all these species the endopod of the 1st maxilla is wanting, unless it is represented in *E. laticeps* by a single seta: the 2nd basal segment bears three setæ in this species, one projecting distally and two medially; in *E. tenuispinus* it bears two setæ, in *E. magnus* it may have one or two, and in *E. oblongus* it has only a single one. In all four species both the 2nd and 3rd inner lobes are present; the 2nd lobe bears only one seta, but the 3rd lobe bears only one in *tenuispinus* and *magnus* and has two in *laticeps* and *oblongus*. In all four the spines on the 1st inner lobe are provided with rows of small "buttons," and so also is the single spine-like seta arising from the 2nd inner lobe.



Text-fig. 53.—*Euaugaptilus nodifrons* Sars. A, 2nd antenna. B, 1st maxilla. C, 2nd maxilla. D, 2nd leg. E, Abnormal exopod of 3rd leg.

In these species the blade of the mandible is tapering, and in *magnus*, *laticeps* and *tenuispinus* has the same basic pattern ; but in *oblongus*, though it is tapering, the number of teeth is markedly less than in the other species. Judging from the shape of the mandible, *E. californicus*, *romanus* and *depressus*, very inadequately described and figured by Esterly (1913) from the Californian coast, would seem to be related to the species of this group.

Sars (1925, p. 286) in his account of *E. grandicornis* figures the 1st maxilla as devoid of a 3rd inner lobe ; while agreeing in most other respects, the present specimens that I have referred to this species possess a small 3rd lobe bearing a single seta. Relying on Sars' account I placed this species in Group III, but it must be transferred to Group II. The character of the biting ramus of the mandible in this species also agrees with the others in the group.

Euaugaptilus grandicornis Sars. (Text-fig. 54, A–F.)

Euaugaptilus grandicornis, Sars, 1925, p. 286, pl. xciv.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 2 females, adult.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 5 females, adult, 2 juv.

DESCRIPTIVE NOTES.—♀. Total length, 6·17 mm.

This is rather smaller than Sars' examples from the North Atlantic.

The anterior lip of the mouth (Text-fig. 54, A) is strongly chitinized, and on either side of the middle line is produced backwards in a rounded papilla, on the tip of which a series of well-developed glands open ; on either side of this papilla the margin slopes forwards and outwards, and about half way along its length is produced in another rounded eminence, on the inner face of which another gland opens. The surface of the labrum is provided with three rows of fine hairs, an anterior crossing the middle line and two postero-lateral.

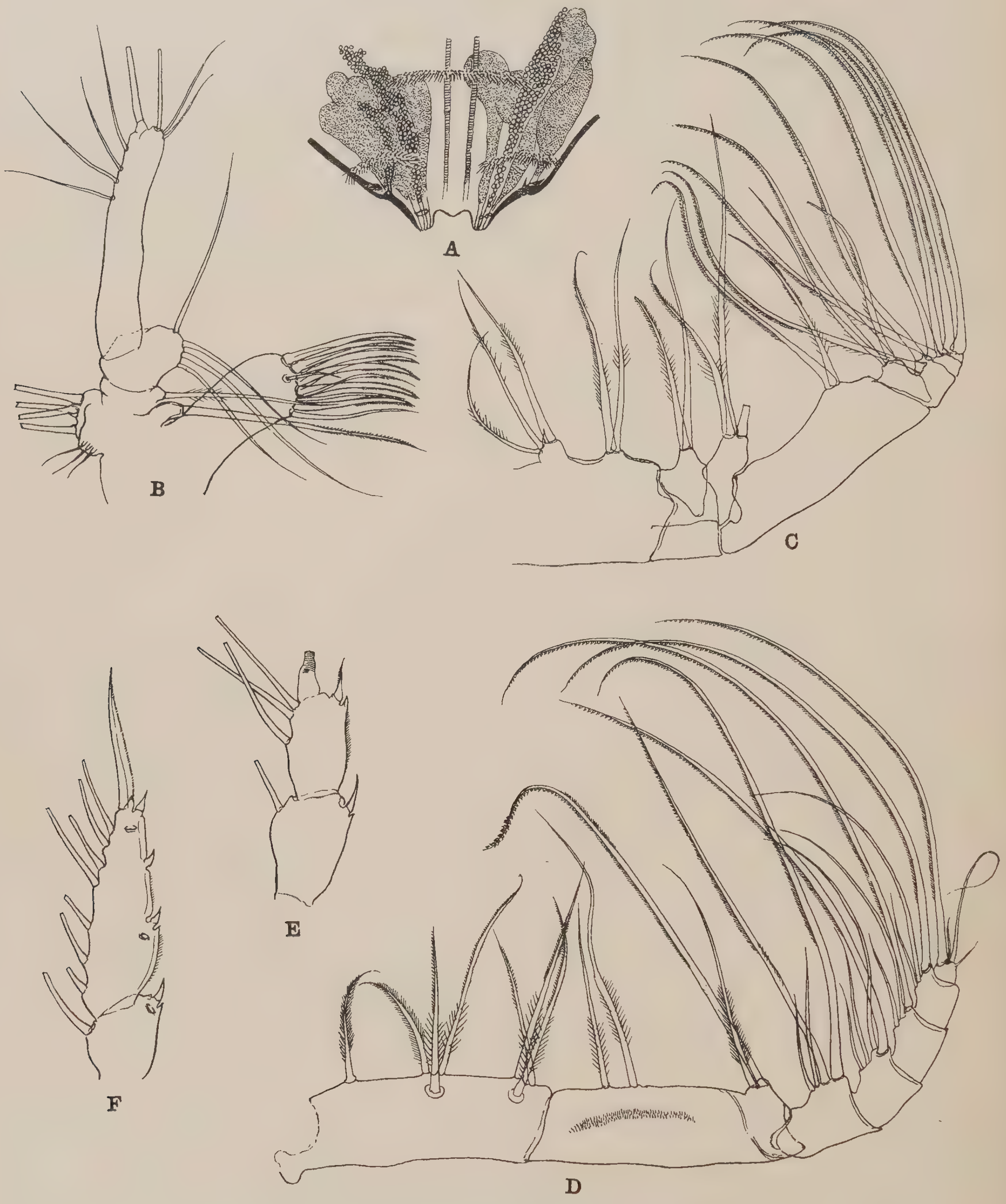
The 1st antenna overreaches the tip of the furcal rami by about the last 7 segments. The proportional lengths of the segments are as follows :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	57	17	24	26	29	29	29	29	32	32	38	47	51	50	51	55	58	58	58	43	42	42	45	34	24 = 1000

In the 2nd antenna the exopod consists of 8 segments, but the joint between the 7th and 8th is not very well marked.

The mandible is as figured by Sars (*loc. cit.*, pl. xciv, fig. 6).

The 1st maxilla (Text-fig. 54, B) differs slightly from the account and figure given by Sars ; the 1st inner lobe bears 11 setæ, the larger ones being fringed with spinules ; the 2nd inner lobe bears a single stout and long seta ; the 3rd inner lobe, not shown by Sars, is present, though of a reduced size, and bears a single rather small seta ; the portion of the appendage that corresponds to the 2nd basal segment bears 3 setæ directed inwards towards the mouth, and a fourth one that projects somewhat distally ; possibly this represents the remains of the endopod. The exopod bears 8 setæ, of which the four outer are of moderate size, the 5th is very long and stout, the 6th is large, and the 7th and 8th are small.



Text-fig. 54.—*Euaugaptilus grandicornis* Sars, ♀. A, The glands of the anterior lip of the mouth. B, 1st maxilla. C, 2nd maxilla. D, Maxilliped. E, Exopod of 3rd leg, abnormal. F, Exopod of 4th leg, abnormal.

In the 2nd maxilla (Text-fig. 54, C) and maxilliped (Text-fig. 54, D), which possess the usual form, the distal setæ are provided with discrete hairs in the proximal half of their length, and distally are fringed with structures that appear to be small, closely-set "buttons."

The swimming legs are of the usual type. The exopods of both the 3rd and 4th legs on one side are abnormal, probably as a result of injury (Text-fig. 54, E and F).

This species is tinged a yellow colour, which is especially marked on the 2nd maxilla, the maxilliped and the swimming legs.

DISTRIBUTION.—Hitherto known only from the North Atlantic Ocean, west of the Azores (Sars); the present record extends the distribution to the Arabian Sea.

Euaugaptilus laticeps Sars. (Text-fig. 55, A–H; Text-fig. 56, A–D.)

Euaugaptilus laticeps, Sars, 1925, p. 264, pl. lxxx, figs. 1–14.
Augaptilus antarcticus, Wolfenden, 1911, p. 334, pl. xxxvi, figs. 6, 7, text-fig. 70, *a–f*.
Augaptilus placitus, A. Scott, 1909, p. 137, pl. xlii, figs. 10–19.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 3 females, adult, 1 juv.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 juv.

DESCRIPTIVE NOTES.—Adult: ♀. Total length 8·33 mm. Wolfenden (*loc. cit.*, 1911) gives the length of *antarcticus* as 8·55 mm., and A. Scott (*loc. cit.*, 1909) gives that of *placitus* as 10·0 mm.

The proportional lengths of the anterior and posterior regions of the body are as 80 to 20 in the present specimen; Wolfenden gives the proportions in *antarcticus* as 6·75 to 1·8, or 79 to 21. The proportional lengths of the various segments of the body are as follows, and for purposes of comparison I have given the corresponding lengths in an immature example in Stage IV:

	Cephalon, Th 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
Adult	435	128	70	64	95	80			27	44	57 = 1000
Stage IV	439	138	78	69	80	47	31	56			62 = 1000

From the above it seems clear that during development there is a progressive reduction in the lengths of the cephalon and the anterior 4 thoracic segments: in the 5th thoracic segment and the abdominal segments the process is in the opposite direction, the segments exhibiting a relative lengthening; but in the furcal rami there is again a shortening, similar to that which takes place in the anterior region.

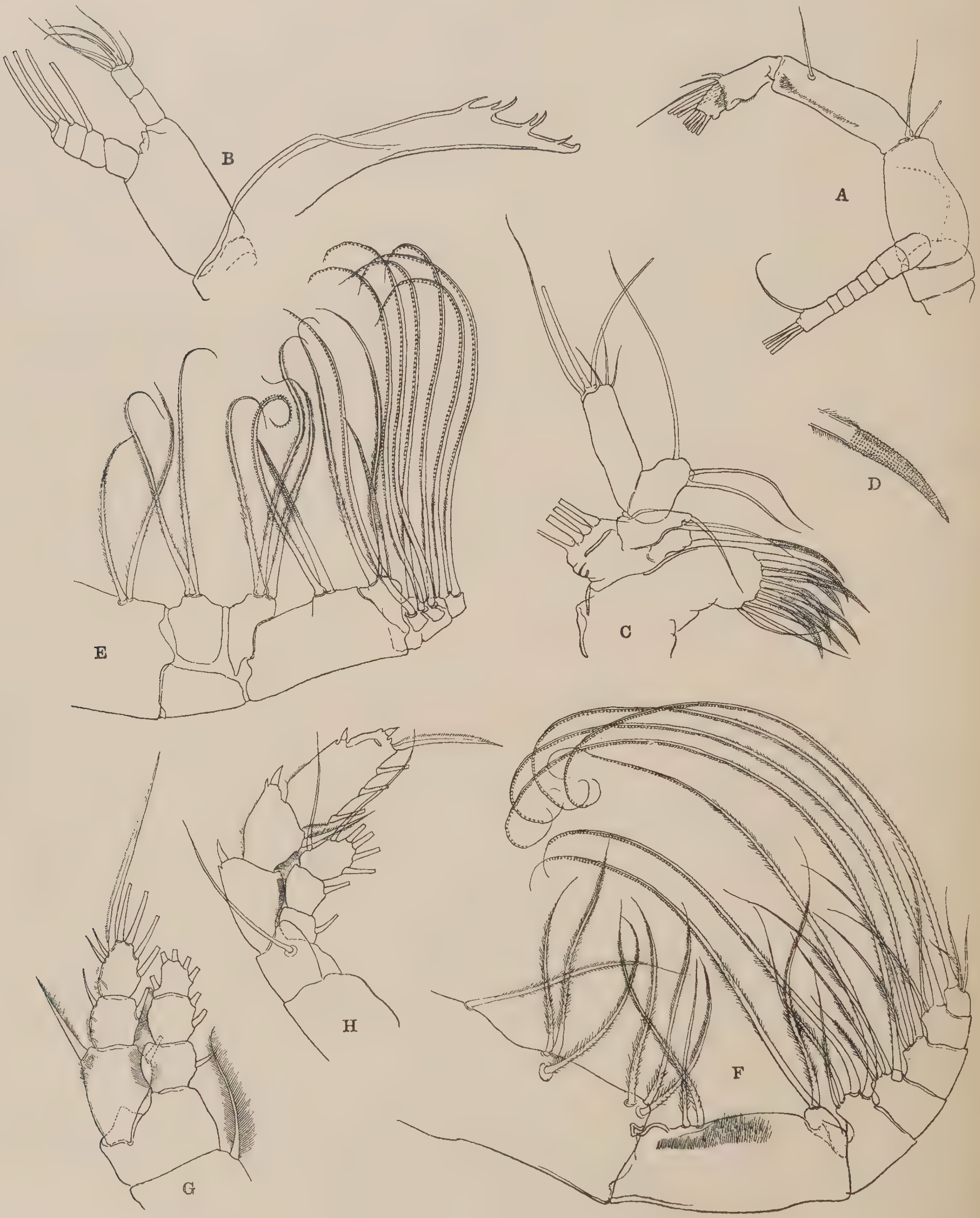
The 1st antenna overreaches the furcal rami by several segments; Wolfenden (1911) states that in *antarcticus* they overreach by six segments, whereas A. Scott gives three segments in *placitus*. In the present specimens they overreach the furca by some six segments, as in *antarcticus*.

The proportional lengths of the various segments are as follows:

Segment.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
Stage VI	68	16	24	24	27	29	29	30	32	36	40	46	52	58	49	50	52	58	49	41	41	41	46	38	24 = 1000
Stage IV	69	14	18	18	24	24	24	25	26	30	35	46	48	48	40	45	50	55	57	50	52	54	58	51	38 = 1000

For purposes of comparison I have also given the proportional lengths of the segments in Stage IV.

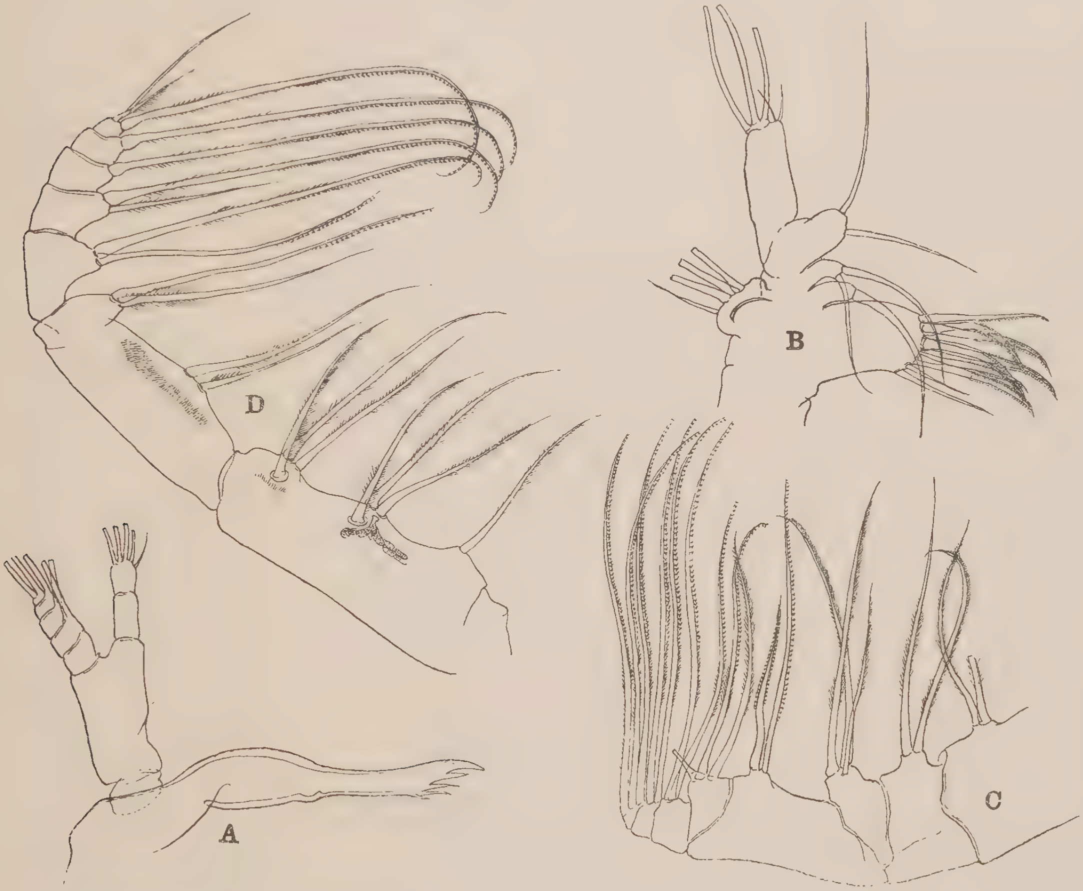
In the 2nd antenna (Text-fig. 55, A) the endopod is about 1½ times the length of the



Text-fig. 55.—*Euaugaptilus laticeps* Sars, ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, One of the spinse on the 1st inner lobe of 1st maxilla. E, 2nd maxilla. F, Maxilliped. G, 1st leg. H, 5th leg.

exopod. The exopod arises close to the proximal end of the 2nd basal segment: it consists of 8 segments, of which only the 8th bears setæ. In the endopod the 1st segment is fringed with a band of hairs along its inner margin and there is a clump of hairs on the inner aspect of the 2nd segment, exactly as Wolfenden has figured in *antarcticus* (1911, fig. 70, *a*).

The mandible (Text-fig. 55, B) is exactly as figured by A. Scott in *placitus*, except that the endopod bears only six short setæ, whereas Scott states that there are seven in his example. In stage IV only five setæ are present in this situation.



TEXT-FIG. 56.—*Euaugaptilus laticeps* Sars. Stage IV. A, Mandible. B, 1st maxilla. C, 2nd maxilla. D, Maxilliped.

In the 1st maxilla (Text-fig. 55, C) the exopod bears three large and three small setæ, as described by Wolfenden in *antaracticus.* The anterior seven spines on the 1st inner lobe and the single spine on the 2nd inner lobe are all densely fringed in the distal half of their length with numerous small buttons, closely crowded together, thus giving the appearance of a mosaic pavement (Text-fig. 55, D).

The 2nd maxilla (Text-fig. 55, E) is of the usual type. The various lobes bear 3, 2, 2, 3, 2, 3 setæ, and, in addition, on the 1st lobe there is a very small rudimentary seta, as in *E. nodifrons*.

In the maxilliped the 1st basal segment bears 1, 3 and 3 setæ on the three lobes: the 2nd segment bears 2 groups of 2 setæ; and the 1st and 2nd segments of the endopod each bear 4 setæ, the 3rd and 4th segments 3 each, while the end segment bears 1 large seta and 3 small ones. The long setæ are armed with rows of "buttons."

In the 1st swimming leg (Text-fig. 55, G) basal 2 is without a seta on the outer border, as Wolfenden has noted in *antarcticus*.

The 2nd–5th legs resemble those of other members of the genus. In the 1st and 2nd legs I have been unable to detect any glands that open on the surface of the segments of the exopod; but in legs 3 and 4 a large gland opens by a wide pore near the base of the marginal spine on exopod 2, and others on segment 3 near the bases of the 1st and 3rd marginal spines. In the 5th leg (Text-fig. 55, H) a gland opens by a large pore near the base of the distal marginal spine.

STAGE IV.—One example in stage IV was taken at Sta. 172.

Total length, 5·29 mm.

The proportional lengths of the anterior and posterior region of the body are as 81 to 19. The proportional lengths of the various segments of the body and of the 1st antenna are as given above (*vide* p. 209).

The mouth parts (Text-fig. 56, A–D) already closely resemble those of the adult, but the full complement of setæ has not yet been developed:

	Stage IV.	Stage VI.
1st maxilla :		
Inner lobe 1	9	10
,, ,, 2	1	1
,, ,, 3	2	2
2nd basal	2	3
Outer lobe	3 large 1 small	3 large 1 small
Exopod	3 large 2 small	3 large 3 small
2nd maxilla :		
Lobe 1	3	3 + 1 small
,, 2	2	2
,, 3	2	2
,, 4	3	3
,, 5	2	2
,, 6	3	3
Maxilliped :		
Basal 1 Lobe 1	1	1
,, 2	3	3
,, 3	3	3
,, 2 ,, 4	2	2
,, 5	2	2
Endopod 1	2	4
,, 2	2	4
,, 3	1	3
,, 4	1	3
,, 5	3	4

In the swimming legs the rami are incompletely divided; in the 1st–4th legs there are only two segments in each ramus, and in the 5th leg each ramus is represented by a single segment. The setal formula is as follows:

	Endopod		Exopod.			
			Inner.		Outer.	
	1.	2.	1.	2.	1.	2.
P. 1	1	7	1	4	1	3, 1
P. 2	1	9	1	5	1	3, 1
P. 3	1	8	1	5	1	3, 1
P. 4	1	7	0	5	1	3, 1
P. 5	6		3		3, 1	

As in the adult, there are no glands opening on the 1st and 2nd legs; on legs 3 and 4 a single gland opens by a wide pore near the base of the distal marginal spine on exopod 2.

Distribution.—This species is widely distributed; it has now been taken in the temperate region of the North Atlantic Ocean (Sars), off the Irish coast and in the Bay of Biscay (Farran), the Mediterranean Sea (Sars), the Arabian Sea (present record), the Laccadive Sea (Sewell), the Pacific Ocean (Sars) the Malay Archipelago (A. Scott, as *A. placitus*) and the Antarctic Ocean (Wolfenden, as *A. antarcticus*, Farran).

Euaugaptilus magnus (Wolfenden).

Augaptilus magnus, Wolfenden, 1904 (April), p. 122; *idem*, 1911, p. 341, pl. xxxvii, figs. 4–9, text-fig. 73, *a*, *b*.
Euaugaptilus magnus, Sars, 1925, p. 262, pl. lxxix, figs. 1–16.
Augaptilus fungiferus, Steuer, 1904 (June), p. 597.
Augaptilus validus, A. Scott, 1909, p. 138, pl. xliii, figs. 1–10.

Occurrence:

Sta. 61 A, Northern part of Arabian Sea, 1500–0 m., 3 juv.; 2000–0 m., 1 female.
Sta. 61 C, Northern part of Arabian Sea, 1500–0 m., 4 females, 2 juv.
Sta. 96, Central part of Arabian Sea, 645–400 m., 2 females.
Sta. 172, Central part of Arabian Sea, 850–0 m., 3 juv.; 2091–0 m., 1 female.
Sta. 186, Gulf of Aden, 600–0 m., 1 female.

Descriptive Notes.—Without a careful and complete re-examination of the types it is extremely difficult, if not impossible, to distinguish with certainty several species that have been described by various authors. Of the species that I refer to Group 2, the following possess 8 segments in the exopod of the 2nd antenna, *Euaugaptilus laticeps* Sars, *E. squamatus* (Giesbrecht), *E. subfiligerus* (Wolfenden), *E. magnus* (Wolfenden), *E. fungiferus* (Steuer), and *E. validus* (A. Scott). Of these *Euaugaptilus magnus* (Wolfenden), *E. fungiferus* (Steuer) and *E. validus* (A. Scott) are distinguished from the others by the complete absence of any rostral filaments. The present specimens appear to me to agree closely with the form described by Steuer under the name *fungiferus*; Wolfenden (1911, p. 336, pl. xxxvi, fig. 8, text-fig. 71 *a*, *b*) has also described what he thought might be an example of *fungiferus* Steuer, but this account differs in several particulars from Steuer's original description, especially in the length and proportions of the furcal rami and in the number of setæ arising from the various lobes of the 1st maxilla. I am unable to discover any valid difference between Steuer's *fungiferus* and A. Scott's *validus*, and I believe that they represent the same species. Wolfenden's species *E. magnus* also comes extremely close, and almost the only difference that I have been able to detect is in the shape of the terminal portion of the biting ramus of the mandible, that in *magnus* appears, so far as one can judge from the figures given by different authors, to be considerably less tapered than in *fungiferus*, though it bears exactly the same number of teeth ; but such a difference may well be due to the angle at which the ramus is viewed. So slight is this difference that I am inclined to regard all three forms as races of the same species, and Wolfenden's name *magnus* would have priority.

forma *fungiferus* Steuer. (Text-fig. 57, A–D.)

♀. Total length varies from 7·083 to 7·408 mm.

The proportional lengths of the cephalothorax and abdomen are as 76 to 24, and the cephalothorax is about twice as long as broad. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–3.	Abd. 4.	Abd. 5.	Furca.
414	130	65	65	85	129	34	34	44 = 1000

The furcal rami are as long as broad and the 2nd furcal seta is slightly longer than the others. There is a small accessory seta. The rostrum agrees exactly with the figure given by A. Scott, and forms a broadly rounded bifurcate papilla without any filaments.

The 1st antenna in most examples extends only as far as the tip of the furcal ramus, but in one example, that in other respects appeared to be identical with the rest, the appendage over-reached the top of the furcal ramus by the last two segments ; this variation is probably caused by the degree to which the body segments are telescoped into each other, thus slightly altering the total length.

The segments of the 1st antenna have the following proportional lengths :

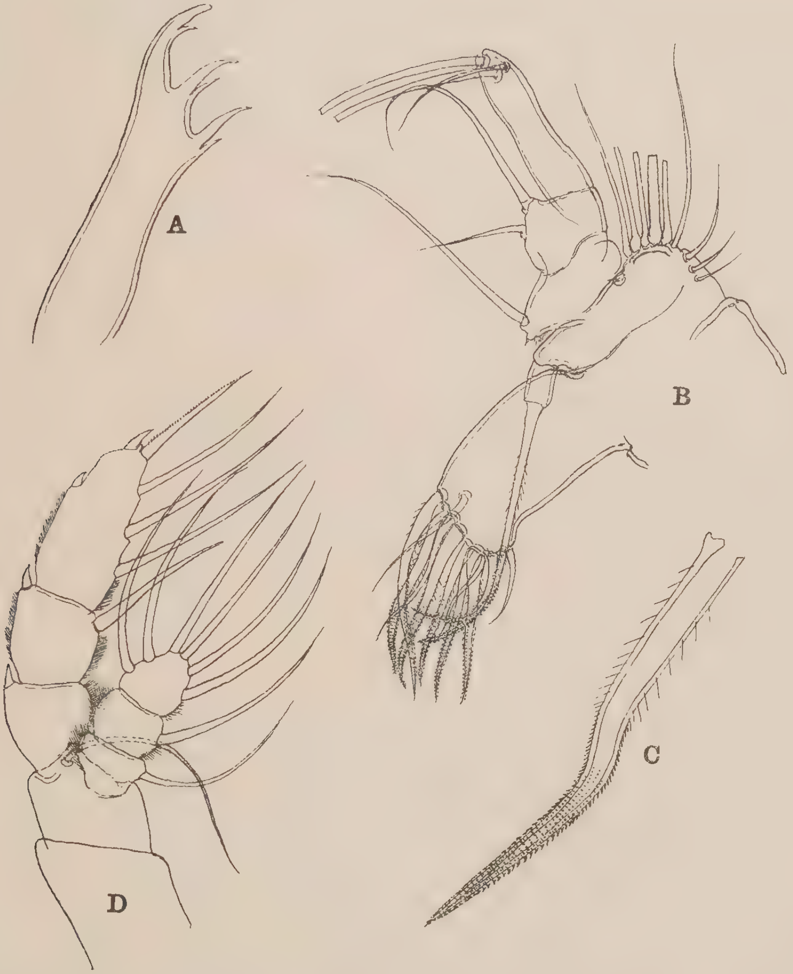
Segment 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
55	11	19	22	26	27	28	31	35	38	40	48	51	52	55	59	63	62	56	42	44	36	38	34	28 = 1000

In the 2nd antenna the exopod consists of eight segments :

Wolfenden (1911, p. 337), in his description of what he took to be a specimen of *E. fungiferus* Steuer captured by the "Gauss" in the Atlantic Ocean, states that "Der Ausenast der hinteren Antennen ist nur so lang wie das 1. Glied des Innenastes, und dreigliedrig." Unfortunately, in attempting to group the various species (*vide* Sewell, 1932, p. 314) I followed Wolfenden and separated *E. fungiferus* from the others in the same group on account of this supposed reduction in the number of segments ; Steuer correctly gave eight as the number of segments in this ramus, and Scott's *validus* also possesses this number of segments.

In the mandible (Text-fig. 57, A) the biting ramus is elongate and tapers to a point, the biting edge being set very obliquely on the shaft, as A. Scott (1909, pl. xlii, fig. 6) has shown in *E. validus*. Both Wolfenden and Sars figure the biting edge of the mandible in *E. magnus* as terminating much more bluntly.

The arrangement and number of setæ arising from the different parts of the 1st maxilla (Text-fig. 57, B) in the present specimens agree with the accounts of both *fungiferus* and *magnus*.



TEXT-FIG. 57.—*Euaugaptilus magnus* (Wolfenden), f. *fungiferus* Steuer. A, Biting ramus of mandible. B, 1st maxilla. C, One of the spines of the 1st inner lobe of 1st maxilla. D, 5th leg.

	fungiferus (Steuer).	*magnus* (Wolfenden).	Present specimens.
Le.	5 large 4 small (6th largest)	5 large 3 small (5th largest)	5 large 4 small (6th largest)
Li. 1	11	8 plus 2	8 plus 3
Li. 2	1 large	1 large	1 large
Li. 3	1	1	1
B. 2 (or endopod)	1	1	1 (or 2)
Exopod	3 large, 2 small	2 large, 1 small	2 large, 1 small

I have assumed that the above arrangement of the setæ on the 2nd basal and exopod of *fungiferus* is what Steuer intended; in his account of the latter region he states that there are 2 large and 2 small on one side of the outer ramus, and 1 large on the other side. In both this species and in *laticeps* the setæ on the biting ramus are armed with rows of what appear to be small "buttons."

The 2nd maxilla agrees exactly in *fungiferus* and *magnus* and in the present examples.

	fungiferus (Steuer).	*magnus* (Wolfenden).	Present examples.
L. 1	3 and 1	3	3 and 1
L. 2	1	1	1
L. 3	2	2	2
L. 4	3	3	3
L. 5	2	2	2
L. 6	3	3	3
Ri. 1	2	7	2
Ri. 2	2		2
Ri. 3	3		3

Steuer records the presence of a small spine on the 1st lobe in addition to the 3 setæ, and the same is present in my examples.

In the maxilliped the proportional lengths of the two basal segments and the endopod appear to be identical in *magnus* and the present examples.

	Basal 1.	Basal 2.	Endopod.
magnus (Wolfenden)	20	20	15
Present specimens	65	65	50

I can find no differences in the structure of the swimming legs in all three forms.

DISTRIBUTION.—If I am correct in regarding all these so-called species as forms of the same, the distribution is as follows: west coast of Greenland and south of Davis Strait (as *magnus*, Jespersen), in the North Atlantic Ocean (as *magnus*, Sars), off the Irish coast (as *magnus*, Wolfenden, Farran), the Bay of Biscay (as *magnus*, Farran), the South Atlantic Ocean (as *magnus*, Wolfenden), the Indian Ocean (as *fungiferus*, Steuer), the Arabian Sea and Gulf of Aden (present records), the Malay Archipelago (as *validus*, A. Scott).

STAGE V. ♂. Total length, 6·33 mm.

The proportional lengths of the anterior and posterior region of the body are as 79 to 21. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
373	135	83	78	91	57	38	31	70	44 = 1000

In the 1st antenna the proportional lengths of the segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
Right	65	14	21	23	27	29	29	29	31	33	34	45	47	49	52	54	60	60
Left	61	13	23	25	30	30	30	33	34	36	38	49	49	50	55	58	64	62

Segment	19.	20.	21.	22.	23.	24.	25.
Right	58	42	46	38	42	40	32 = 1000
Left	49	31	37	35	39	38	31 = 1000

On the left side segments 17, 18 and 19 are each produced in a spine that overlaps the following segment. Segments 3, 7, 9, 14, 18, 21 and 25 in both antennæ bear a long seta.

The 2nd antenna resembles that of the adult.

In the mouth parts the several appendages have attained the adult form, but the full complement of setæ has not yet been attained. The differences are shown below:

	Stage V.	Stage VI.
1st maxilla :		
Inner lobe 1	10	10
,, ,, 2	1	1
,, ,, 3	1	1
2nd basal	1	1 or 2
Outer lobe	8	9
Exopod	2 large 1 small	2 large 1 small
2nd maxilla :		
Lobe 1	3, 1 rudimentary	3
,, 2	1	1
,, 3	2	2
,, 4	3	3
,, 5	2	2
,, 6	3	3
Maxilliped :		
Lobe 1	1	1
,, 2	3	3
,, 3	3	3
,, 4	2	2
,, 5	2	2
Endopod 1	3	4
,, 2	3	4
,, 3	2	3
,, 4	2	3
,, 5	3	3

In the swimming legs the rami are three-jointed except in the 5th pair, in which there are only two segments present, segments 2 and 3 not yet having separated. The setal formula has attained its full development in the anterior four pairs of legs, and in the 5th pair the full complement of setæ and spines is present:

				Exopod.					
	Endopod.			Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	2	5	1	1	4	1	1	2, 1
P. 2	1	2	7	1	1	5	1	1	3, 1
P. 3	1	2	8	1	1	5	1	1	3, 1
P. 4	1	2	7	1	1	5	1	1	3, 1
P. 5	1	7		0	4		1	3, 1	

In the adult female the formula for P 5 is 1 . 1 . 6 ; 0 . 1 . 3 ; 1 . 1 . 2, 1.

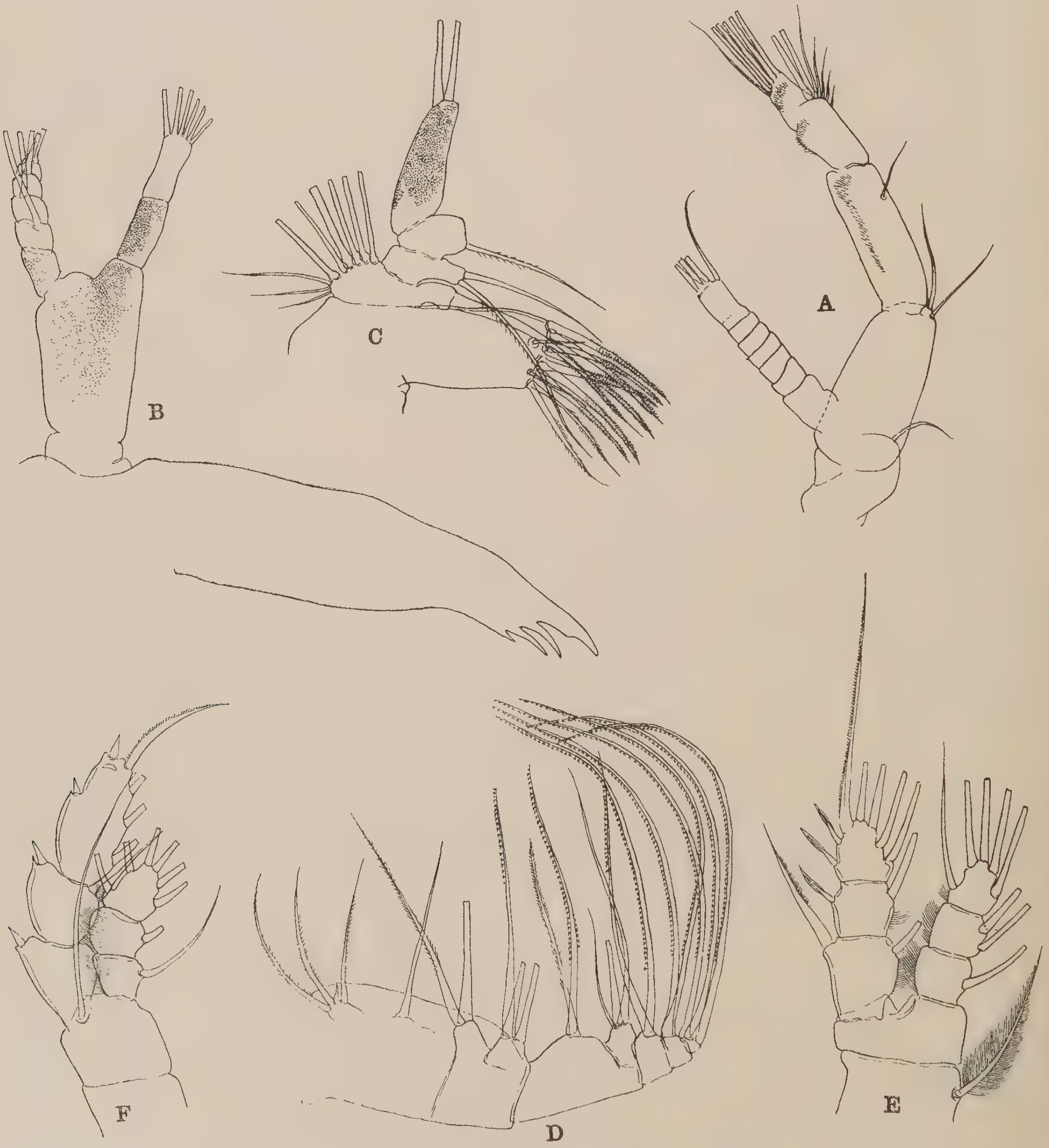
Euaugaptilus oblongus Sars. (Text-fig. 58, A–F.)

Euaugaptilus oblongus, Sars, 1925, p. 266, pl. lxxxi, figs. 1–16; Sewell, 1932, p. 322.

Occurrence:

Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 172, Central part of Arabian Sea, 850–0 m., 2 females.

Descriptive Notes.—♀. Total length, 6·15 mm.



Text-fig. 58.—*Euaugaptilus oblongus* Sars, ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, 2nd maxilla. E, 1st leg. F, 5th leg.

The proportional lengths of the anterior and posterior regions of the body are as 75 to 25. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–3.	Abd. 4.	Abd. 5.	Furca.
374	134	80	77	91	107	36	52	49 = 1000

The rostrum is represented by a pair of short, stout spinous prominences. The posterior thoracic margin is bluntly rounded.

The 1st antenna overreaches the furcal rami by about the last five segments. The proportional lengths of the antennal segments are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
58	15	22	24	28	30	31	34	36	39	43	52	55	52	55	55	55	51

19.	20.	21.	22.	23.	24.	25.
48	36	39	35	40	39	28 = 1000

Segments 3, 9, 18, 21, 24 and 25 each bear a long seta.

In the 2nd antenna (Text-fig. 58, A) the exopod is composed of only 7 free segments, the two distal segments being fused, though a trace of the line of separation can be seen ; only the distal segment bears any setæ.

In the mandible (Text-fig. 58, B) the two rami of the palp are of approximately equal length ; the endopod bears six setæ distally. The proximal segments of both endopod and exopod, as well as the 2nd basal segment, are ornamented with numerous small fine bosses. The biting ramus is tapered and terminates in an oblique row of only four teeth, of which the 1st is stout and powerful, the 2nd and 3rd subequal and the 4th quite small.

In the 1st maxilla (Text-fig. 58, C) the biting ramus is well developed and bears 9 elongate spines, of which the anterior 7 are armed with small spinules, gradually changing to small " buttons " distally, and two other delicate, smaller setæ, which appear to be smooth. The 2nd inner lobe bears a single stout seta and the 3rd inner lobe possesses a pair of sub-equal setæ. The 2nd basal segment carries a single seta. The endopod is absent. The exopod, like the proximal segments of the exopod and endopod of the 2nd antenna, is ornamented with numerous small bosses, scattered over the surface ; it bears distally only two setæ. The outer lobe bears in all 9 setæ, of which the three proximal are small and delicate, the 4th is of moderate thickness, the 5th is slender, the 6th is long and stout, and the distal three are like the 4th.

In the 2nd maxilla (Text-fig. 58, D) the 1st lobe bears three setæ and a small pointed papilla ; the other lobes bear respectively 1, 2, 3, 2, 3 setæ ; the distal setæ are fringed with small and delicate " buttons."

In the maxilliped the distal setæ are provided with small delicate " buttons."

Distribution.—Up to the present this species has been recorded only from the North Atlantic Ocean (Sars), the Arabian Sea (present records) and the Laccadive Sea (Sewell).

Euaugaptilus tenuispinus Sars, var. (Text-fig. 59, A–F.)

Euaugaptilus tenuispinus, Sars, 1925, p. 290, pl. xcvii, figs. 1–13 ; Sewell. 1932 p. 322.

Occurrence.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.

♀. Total length, 5·30 mm.

This is rather larger than Sars' examples from the Atlantic Ocean, which measured 4·90 mm.

The proportional lengths of the segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–3.	Abd. 4.	Abd. 5.	Furca.
358	154	97	88	90	97	28	41	47 = 1000

The rostrum bears a pair of short spines directed ventrally. A small cervical groove crosses the dorsal aspect of the cephalon. The posterior thoracic margin is produced slightly backwards and is rounded. The genital aperture is not markedly prominent and is situated about the middle of the segment ; a row of fine hairs runs transversely just in front of the aperture. The 2nd furcal seta is longer and slightly thicker than the others ; its length is about twice that of the others.

The 1st antenna over-reaches the furca by about the last three segments. The proportional lengths of the segments are as follows :

Segment 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
48	13	17	18	19	20	23	28	32	37	42	52	56	57	57	56	57	57

19.	20.	21.	22.	23.	24.	25.
54	46	47	43	47	44	30 = 1000

The 1st segment is partly fused with the 2nd. The segments bear long delicate setæ.

In the 2nd antenna (Text-fig. 59, A) the two rami are nearly equal in length. The endopod bears 6 setæ on the outer lobe and 3 large and 4 small setæ on the inner lobe ; these latter small setæ decrease in size from without inwards, the innermost seta being minute. The exopod is composed of eight segments ; segment 1 bears a small delicate seta, segment 2 a seta of moderate length, segments 3 to 6 each bears a long seta, segment 7 a minute seta, and segment 8, 3 large and 1 small setæ.

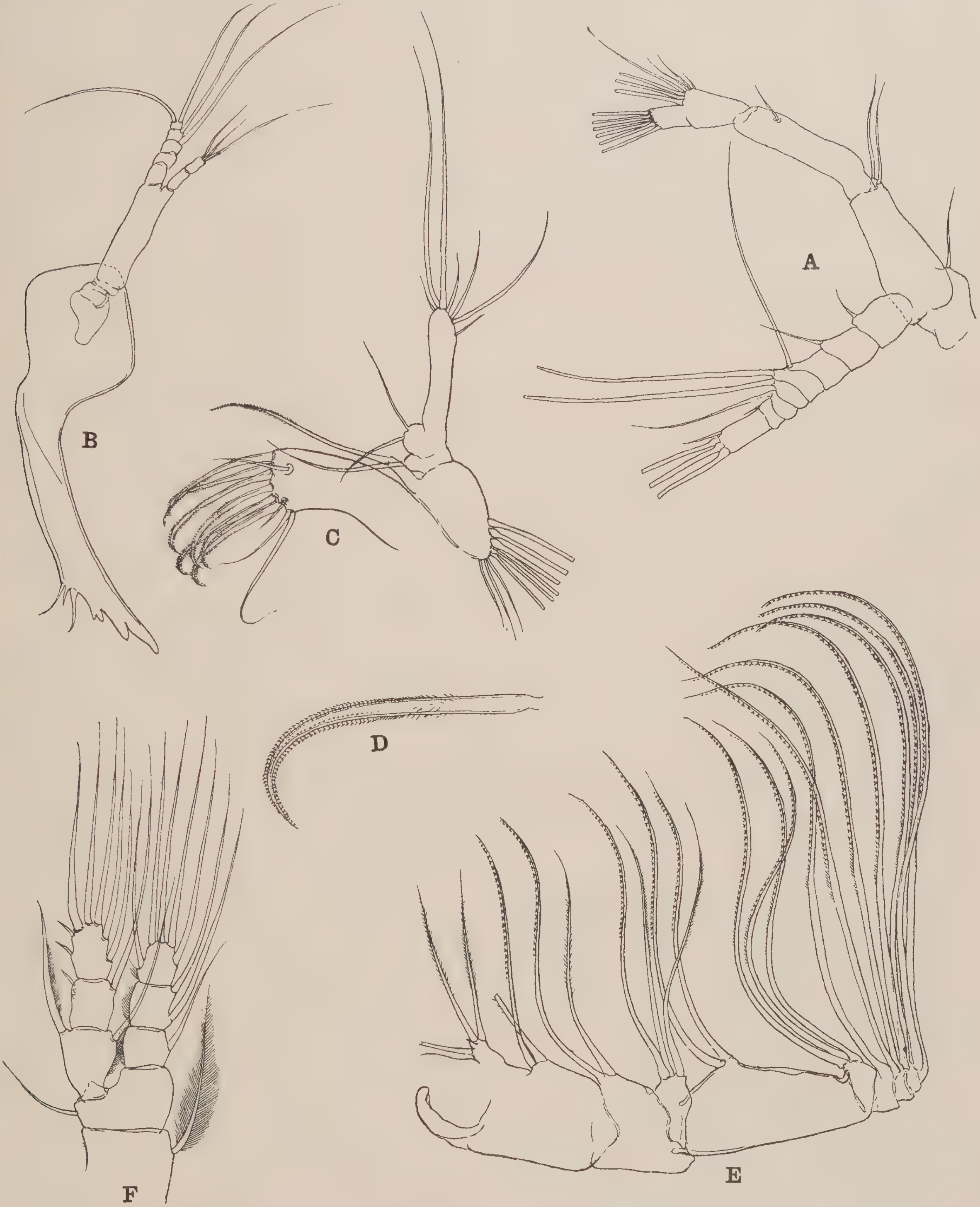
In the mandible (Text-fig. 59, B) the biting ramus is strong, but the edge is considerably more oblique than figured by Sars ; the arrangement of the teeth is, however, the same. the palp is rather small and the basal segment is slender ; the endopod reaches to about the end of the 3rd segment of the exopod and is composed of two segments, the distal bearing 3 delicate setæ. The exopod is composed of 5 segments, segments 1 and 2 are without setæ, segments 3 and 4 each bear 1, and segment 5 carries 2.

In the 1st maxilla (Text-fig. 59, C) the lobes bear the following setæ :

1st inner lobe . .	11 setæ.
2nd ,, ,, . .	1 large seta.
3rd ,, ,, . .	1 small seta.
2nd basal . . .	2 setæ.
Exopod . . .	4 setæ on the outer margin and 2 large and 1 small distally.
Outer lobe . . .	6 large and 3 small setæ.

This specimen differs from those of Sars' by having only two setæ, instead of three, on the 2nd basal segment. Seven of the setæ on the 1st inner lobe are fringed with closely set " buttons " (Text-fig. 59, D).

The 2nd maxilla (Text-fig. 59, E) is well developed and bears the following setæ on the various lobes: Lobe 1, 3, and a very short pointed process; lobe 2, 2; lobe 3, 2; lobe 4, 3; lobe 5, 2; and lobe 6, 3; the endopod bears 7 setæ. Most of the setæ are fringed with "buttons."



Text-fig. 59.—*Euaugaptilus tenuispinus* Sars, ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, One of the biting spines of inner lobe I, enlarged. E, 2nd maxilla. F, 1st leg.

The maxilliped is also well developed and bears the following setæ: lobe 1, 1 seta; lobe 2, 3; lobe 3, 3; lobe 4, 2; lobe 5, 2, of which one is large; the endopod bears on segment 1, 2 small and 2 large; segment 2, 3 small and 1 large; segments 3 and 4, 2 small and 1 large; and segment 5, 1 small and 1 large; all the large setæ on lobe 5 and the endopod are provided with "buttons."

The 1st leg (Text-fig. 59, F) agrees exactly with Sars' figure; the marginal spine on exopod 1 is large and reaches well beyond the end of the ramus; the marginal spines on exopod 2 and 3 are small and delicate.

The 5th leg also agrees exactly with Sars' figure.

The only real difference between this specimen and Sars' examples is the loss of one seta on the 2nd basal segment of the 1st maxilla.

Distribution.—The North Atlantic Ocean near Gibraltar, the Canary Islands and the Azores (Sars), the Arabian Sea (present record) and the Laccadive Sea (Sewell).

Group III.

Five species that I have placed in Group III are present in the collection, namely, *Euaugaptilus angustus*, *E. facilis*, *E. digitatus*, *E. longimanus* and *E. longicirrhus*. Of these, *facilis* and *digitatus* are closely related. In both the shape of the mandible is the same, and the characters of the 1st maxilla are almost identical; and in both species there is the same tendency for the external margin of the exopod of the 2nd and 3rd swimming legs to be produced in rounded prominences at the base of the marginal spines, though this is more marked in *digitatus* than in *facilis*. *Euaugaptilus angustus* agrees with the other members of the group in that the endopod of the 1st maxilla is absent, as also is inner lobe 3, while lobe 2 is still present; but the general shape of the biting ramus of the mandible is very similar to that of species in Group II. *E. longicirrhus* is an aberrant form, in which the mandibular palp has undergone reduction.

Euaugaptilus angustus Sars. (Text-fig. 60, E.)

Euaugaptilus angustus, Sars, 1925, p. 281, pl. xci, figs. 1–14; Sewell, 1932, p. 322.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.

Remarks.—The present specimen differs from that figured by Sars in that the 2nd basal segment of the 1st maxilla on one side bears only 2 setæ, whereas Sars (1925, pl. xci, fig. 6) shows it as having three.

A gland opens on the anterior margin of the biting ramus not far from the origin of the most anterior spine (Text-fig. 60, E).

In all other respects the present specimens agreed very closely with Sars' description and figures.

Distribution.—North Atlantic (Sars), the Arabian Sea (present records) and the Laccadive Sea (Sewell).

Euaugaptilus digitatus Sars.

Euaugaptilus digitatus, Sars, 1925, p. 275, pl. lxxxvii, figs. 1–16.

Occurrence.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.

Distribution.—The North Atlantic Ocean (Sars) and the Arabian Sea (present record).

Euaugaptilus facilis (Farran).

Augaptilus facilis, Farran, 1909, p. 73, pl. iii, figs. 23, 24, pl. vii, figs. 1–6; Wolfenden, 1911, p. 343, pl. xxxviii, figs. 1, 2; text-fig. 75, *a*, *b*.
Euaugaptilus facilis, Sars, 1925, p. 273, pl. lxxxvi, figs. 1–15; Sewell, 1932, p. 322.

Occurrence.—Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Distribution.—This species has now been recorded from the region south of Davis Strait (Jespersen), the coast of Ireland (Farran), the North Atlantic Ocean (Sars), the South Atlantic (Wolfenden), the Arabian Sea (present record), the Laccadive Sea (Sewell), and the Pacific Ocean (Sars).

Euaugaptilus longimanus Sars. (Text-fig. 60, a–d; Text-fig. 61, a–j.)

Augaptilus longimanus, Wolfenden, 1911, p. 340, text-fig. 73, *a–c*.
Euaugaptilus longimanus, Sars, 1925, p. 282, pl. xcii.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female, adult.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 juv.
Sta. 76, Gulf of Oman, 1500–0 m., 1 juv.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female, juv.

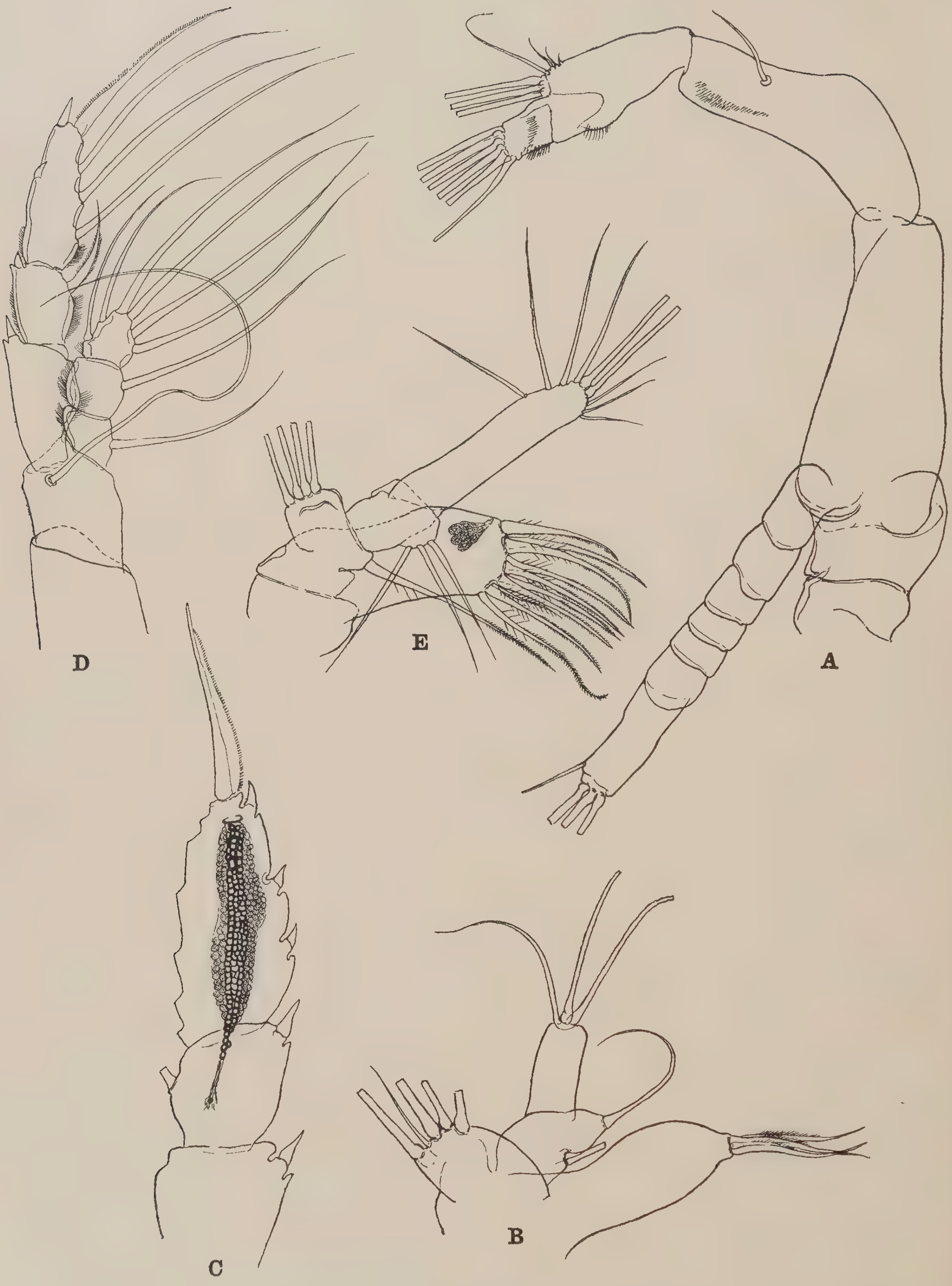
Stage VI.—Adult ♀. Total length, 9·5 mm.

This is very much larger than the specimens obtained by Sars and Wolfenden in the Atlantic Ocean, which measured only 5·8 and 5·3 mm. respectively. A young ♀ in Stage V has a total length of 4·15 mm. The proportional lengths of the anterior and posterior regions of the body are as 76 to 24: Wolfenden (1911, p. 340) gives the proportions as 4·4 mm. to 0·9 mm., or 83 to 17. The proportional lengths of the various segments of the body are as follows, and for convenience of reference I have given here the proportional lengths in the immature stages:

	Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
Stage V ♂	420	134	74	70	79	48	39	32	56		48 = 1000
,, V ♀	428	123	68	68	77	89		34	56		47 = 1000
,, VI ♀	371	145	73	76	94	121			34	40	46 = 1000

The general form of the body agrees exactly with Sars' description. The genital segment is swollen ventrally and the swelling is covered with hairs. The 2nd furcal seta is about twice the length of the 4th, which is in turn about twice the length of the 1st. The accessory seta is very delicate and is about half the length of the 4th seta.

The 1st antenna overreaches the tip of the furcal ramus by about the last 5 or 6 segments. The proportional lengths of the various segments are as follows, and for reference I have given here also the lengths in the immature female and the unmodified antenna in the immature male:



Text-fig. 60.—*Euaugaptilus longimanus* Sars, adult, ♀. A, 2nd antenna. B, 1st maxilla. C, Exopod of 3rd leg. D, 5th leg. *Euaugaptilus angustus* Sars, ♀. E, 1st maxilla.

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	
Stage V ♀	54	10	13	14	17	18	22	22	29	33	42	54	56	58	57	54	57	56	57	41	44	50	50	53	39	= 1000
,, V ♂	57	11	15	17	21	23	25	29	33	37	41	54	57	49	49	51	56	57	57	47	48	45	48	42	31	= 1000
,, VI ♀	59	12	17	18	22	25	27	31	37	39	43	51	48	49	49	49	52	55	55	45	48	46	51	43	29	= 1000

The 1st and 2nd segments are incompletely separated, especially in the immature stages.

The 2nd antenna (Text-fig. 60, A) agrees exactly with the description and figures given by Sars. Wolfenden (1911, p. 341) states that the outer branch is much shorter than the inner. This is not strictly accurate: the outer branch is actually very slightly longer than the inner, but the latter reaches far beyond the outer ramus owing to the length of the 2nd basal segment.

In the mandible the biting ramus bears comparatively few teeth and agrees closely with the figure given by Wolfenden (1911, fig. 73 *b*). In the palp the endopod is very short and is composed of one long segment and a very short apical portion, that is only partially separated and bears two setæ: the present example thus agrees with Wolfenden's example and differs from Sars' specimen, in which there was only a single apical seta. The exopod is composed of 5 segments, of which the proximal four each bears a single seta, while the 5th segment bears 2 setæ in Stage V (♀) (Text-fig. 61, B), and only 1 in Stage VI.

The 1st maxilla (Text-fig. 60, B) differs slightly in the two stages. In Stage V the 1st inner lobe resembles that of the adult and bears only four teeth, two moderately stout and two more slender and delicate. In both stages the 2nd inner lobe is absent. The 3rd inner lobe is present in both stages; but in Stage V it is devoid of any setæ, whereas in the adult it bears a single short stout seta. Sars appears to have overlooked this. The 2nd basal segment bears two setæ in Stage V and only one in Stage VI. The exopod on the other hand bears only 2 setæ in Stage V and 3 in Stage VI. The external lobe differs on the two sides: on the right side it bears 5 large and 1 very small setæ; the 1st seta reaches back as far as the articulation between the 3rd and 4th thoracic segments, the 2nd seta is extremely short and very delicate, the 3rd seta also reaches back as far as the 4th thoracic segment, and the 4th, 5th and 6th are well developed, but are progressively smaller; on the left side the 6th seta is absent. Wolfenden states that there are only 3 setæ on the outer lobe.

The 2nd maxilla, according to Sars, is "de structure toute normale"; there is, however, a very considerable reduction in the number of setæ arising from the various lobes of the proximal segments, as follows:

Lobe 1 . .	1 large seta and 1 very small and rudimentary.
,, 2 . .	1 seta.
,, 3 . .	1 ,,
,, 4 . .	3 setæ.
,, 5 . .	2 ,,
,, 6 . .	2 ,,
Endopod . .	7 ,,

All the setæ arising from lobes 5 and 6 and from the endopod are provided with "buttons."

In the maxilliped the basal segments are long, and so is the 1st segment of the endopod, which is nearly as long as the 2nd basal segment. The number of setæ arising from the lobes of the basal segments and from the endopod are as follows :

Basal 1	Lobe 1	1 seta.
	,, 2	3 setæ.
	,, 3	3 ,,
Basal 2	,, 4	2 ,,
	,, 5	2 ,,
Endopod 1		3 ,,
,, 2		2 ,,
,, 3		1 seta
,, 4		1 ,,
,, 5		1 large, 1 medium and 1 very small setæ.

With the exception of the two smaller distal setæ, all those arising from the endopod are provided with " buttons." This appendage has already attained its full development in Stage V.

The swimming legs in the main resemble those of other members of the genus ; but the 2nd segment of the endopod of the 1st leg bears only a single seta, instead of two, and the 3rd segment of the endopod of the 3rd leg has only 7, instead of 8 setæ. The setal formulæ of the two stages, V and VI, are as follows :

Stage V :

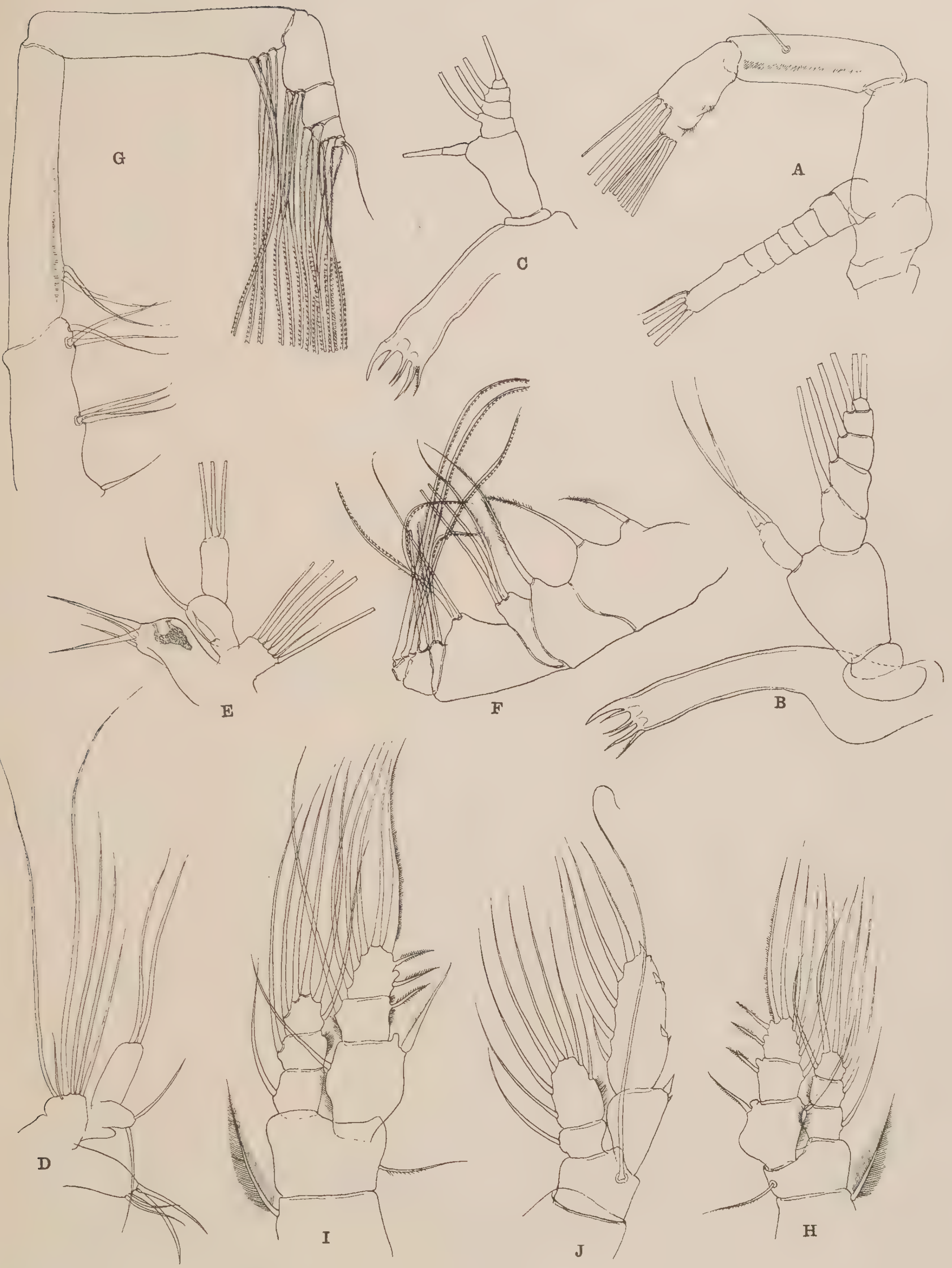
	Endopod.			Exopod.					
				Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	1	5	1	1	4	1	1	2, 1
P. 2	1	1 or 2	7	1	1	5	1	1	3, 1
P. 3	1	2	7	1	1	5	1	1	3, 1
P. 4	1	2	7	1	1	5	1	1	3, 1
P. 5	1	7		0	4		1	3, 1	

Stage VI :

	Endopod.			Exopod.					
				Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	1	5	1	1	4	1	1	2, 1
P. 2	1	2	7	1	1	5	1	1	3, 1
P. 3	1	2	7	1	1	5	1	1	3, 1
P. 4	1	2	7	1	1	5	1	1	3, 1
P. 5	1	1	6	0	1	3	1	1	2, 1

The 2nd basal segment in legs 4 and 5 of the adult each bears a long external seta, but I was unable to detect this in the young stage.

A large gland, extending the whole length of the segment, is situated in exopod 3 of the 3rd leg (Text-fig. 60, c) ; it opens to the exterior by a large pore just below the terminal spine.



Text-fig. 61.—*Euaugaptilus longimanus* Sars, Stage V. A, 2nd antenna, ♂. B, Mandible, ♀. C, Mandible, ♂. D, 1st maxilla, ♀. E, 1st maxilla, ♂. F, 2nd maxilla, ♂. G, Maxilliped, ♂. H, 1st leg, ♀. I, 1st leg, ♂. J, 5th leg, ♂.

In spite of its large size, as compared with specimens from the Atlantic Ocean, there can, I think, be no doubt that this adult is a specimen of *E. longimanus* Sars.

STAGE V.—♂. Total length, 8·567 mm.

The proportional lengths of the anterior and posterior regions of the body are as 78 to 22. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
420	134	74	70	79	48	39	32	56	48 = 1000

The general form of the cephalothorax agrees with that of the adult female.

The 1st antenna overreaches the tip of the furcal rami by about the last five segments. The proportional lengths of the segments differ slightly on the two sides, as will be seen from the following table :

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
Right (unmodified)	57	11	15	17	21	23	25	29	33	37	41	54	57	49	49	51	56	57	57	47	48	45	48	42	31 = 1000
Left (modified)	59	11	17	18	23	26	29	33	38	41	44	54	50	47	47	47	52	56	52	42	47	47	47	42	31 = 1000

The anterior margin of the 17th segment is produced in a long recumbent spine that reaches about one-third of the next segment. The 18th segment bears a horizontal spine that reaches to the end of the segment. The 19th segment bears two horizontal spines, of which the proximal reaches to a little beyond the end of the segment, while the distal reaches nearly to the end of the 20th segment.

The 2nd antenna (Text-fig. 61, A) resembles that of the adult female.

In the mandible the biting ramus resembles that of the female, but the exopod is reduced and is composed of only 4 free segments, each of which bears a single seta.

The 1st maxilla (Text-fig. 61, E) closely resembles that of Stage V of the female (Text-fig. 61, D), but in the present specimen the exopod bears three setæ instead of only two, thus resembling the adult.

The 2nd maxilla (Text-fig. 61, F) resembles that of the adult female.

The maxilliped (Text-fig. 61, G) exhibits certain differences. The numbers of setæ arising from the various lobes and segments are as follows :

Basal 1	Lobe 1	1 seta.
	,, 2	3 setæ.
	,, 3	3 ,,
Basal 2	,, 4	2 ,,
	,, 5	Setæ absent.
Endopod 1		3 setæ.
,, 2		3 ,,
,, 3		2 ,,
,, 4		2 ,,
,, 5		1 large seta, 1 medium and 1 very small.

Thus lobe 5 shows a reduction in the setæ, as compared with the female, whereas endopods 3 and 4 each bear one more seta.

The 1st–4th pairs of swimming legs resemble those of the adult female.

The 5th pair of legs (Text-fig. 61, J) resembles that of the immature female, except that the 2nd basal segment bears a long seta on its posterior aspect, and I have been unable to detect any such seta in the young female.

DISTRIBUTION.—This species was first recorded from the neighbourhood of the Azores and Canary Islands, in the North Atlantic Ocean (Sars), and it has since been taken in the tropical part of the South Atlantic (Wolfenden). The present records extends its distribution to the Arabian Sea and the Gulf of Oman.

? *Euaugaptilus longicirrhus* Sars. (Text-fig. 62, A–H.)

Euaugaptilus longicirrhus, Sars, 1925, p. 291, pl. cviii.

OCCURRENCE.—Sta. 172, Central area of Arabian Sea, 850–0 m., 1 juv.

DESCRIPTIVE NOTES.—♀. Stage V. Total length, 3·7 mm.

The body is somewhat slender and the proportional lengths of the cephalothorax and abdomen are as 81 to 19. The proportional lengths of the various segments are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4–5.	Furca.
439	158	63	63	86	50	27	27	51	36 = 1000

The forehead is rounded and there is a small rounded rostral papilla, from which springs a pair of long, delicate setæ. The 4th and 5th thoracic segments are fused and the posterior thoracic margin is rounded. The segmentation of the abdomen has not reached its final form ; segments 1 and 2 are partially fused ventrally, but the line of demarcation is quite clear across the dorsal aspect. The furcal rami are comparatively short and bear four stout outer setæ, a slender, delicate inner seta and a short accessory seta.

The 1st antenna extends beyond the furcal rami by about the last three segments. The proportional lengths of the segments are as follows :

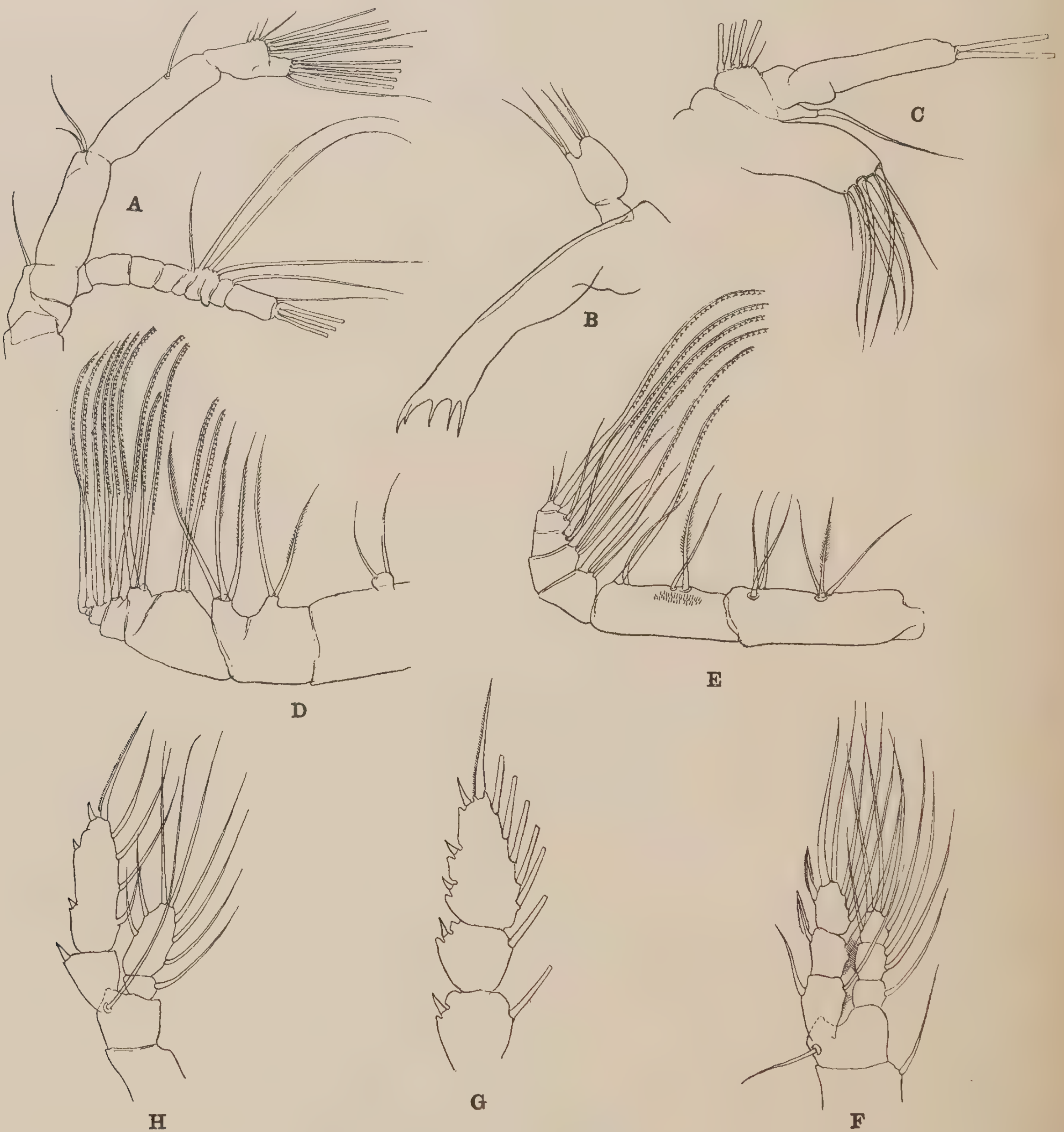
Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	66	17	21	18	22	23	24	26	26	27	33	42	50	50	50	50	57	58

19.	20.	21.	22.	23.	24.	25.
60	49	49	47	54	48	33 = 1000

In the 2nd antenna (Text-fig. 62, A) the two rami are of approximately equal length, but owing to the position of their respective origins, the exopod only reaches as far as the distal end of the 1st segment of the endopod.

The mandible (Text-fig. 62, B) possesses a long, slender biting ramus that bears a pair of stout teeth at the anterior angle ; two long delicate teeth at equal intervals, and a straight spine at the posterior angle. The palp is greatly reduced, and is composed of a short collar-like segment and an oval distal segment, that bears distally two groups of two and three setæ respectively, corresponding to the endopod and exopod. Its general character strongly resembles the appendage in *E. longicirrhus* Sars.

The 1st maxilla (Text-fig. 62, C) also closely resembles that of *E. longicirrhus*. The 1st inner lobe bears 7 long setæ, longer than the ramus itself, and an eighth, shorter and more delicate, at the posterior angle. The 2nd inner lobe bears a single stout seta. The 3rd inner lobe and the endopod are wanting. The exopod is long and bears distally two long setæ. The 1st outer lobe bears 4 long, stout setæ and a 5th small, delicate one.



TEXT-FIG. 62.—*Euaugaptilus longicirrhus* Sars (?), ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, 2nd maxilla. E, Maxilliped. F. 1st leg. G, Exopod of 3rd leg. H, 5th leg.

In the 2nd maxilla (Text-fig. 62, D) the number of setæ on the various lobes are 2, 2, 3, 2, 3. All the setæ arising from lobes 5 and 6, as well as the 7 terminal setæ, are provided with " buttons."

In the maxilliped (Text-fig. 62, E) the proportional lengths of the two basal segments and the endopod are as 40, 31 and 29. The 1st basal segment possesses only two lobes that bear 3 setæ each. The 2nd basal bears two lobes, each supporting 2 setæ; there is a band of small needle-like spinules running along the segment beneath the proximal lobe. The segments of the endopod bear respectively 3, 3, 2, 2 and 3 setæ; those on the terminal segment are very unequal, one being long and stout and the other two very short and delicate. Six of these setæ are provided with "buttons."

In the 1st leg (Text-fig. 62, F) the rami are each composed of three segments. Segment 1 of the exopod bears a long stout seta-like spine; segments 2 and 3 each bears a single marginal spine that is well developed.

The setal formula for the first four pairs of legs is as follows:

	Endopod.			Exopod.					
				Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	2	5	1	1	4	1	1	1, 1
P. 2	1	2	7	1	1	5	1	1	3, 1
P. 3	1	2	8	1	1	5	1	1	3, 1
P. 4	1	2	7	1	1	5	1	1	3, 1

The 5th leg (Text-fig. 62, H) is not yet fully developed, both rami being composed of only two segments; but it is clear that in the next moult the distal segment will divide into two, thus giving the full number of segments in each ramus, while the setal formula will become—

P. 5 . 1 1 6 . 0 1 3 . 1 1 2, 1

Remarks.—The characters of the mandible and 1st maxilla, if still present in the adult stage, would place this species in Group III B, or between this and Group IV B.

Distribution.—Up to the present time *E. longicirrhus* has been recorded only from the North Atlantic Ocean (Sars): if I am right in attributing the above example to this species, its distribution must be extended to the Arabian Sea.

Group IV.

Two species, that I refer to this group, are present in the collection, namely, *Euaugaptilus bullifer* and *E. latifrons*.

Euaugaptilus bullifer (Giesbrecht).

Augaptilus bullifer, Giesbrecht, 1892, p. 400, pl. xxviii, figs. 6, 21, 24, pl. xxxix, fig. 46.
Euaugaptilus bullifer, Sars, 1925, p. 271, pl. lxxxv, figs. 1–16.

Occurrence.—Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female.

Remarks.—Giesbrecht (*loc. cit.*, p. 412) has noted the presence of rows of small spinules around the articulations of the marginal spines of the segments of the exopod of the 1st pair of legs. In this character *bullifer* differs in my experience from all other species of the genus.

Distribution.—The west coast of Ireland (Farran), the North Atlantic Ocean (Sars), the Arabian Sea (present record), the Malay Archipelago (A. Scott), and the Pacific Ocean (Giesbrecht).

Euaugaptilus latifrons Sars.

Euaugaptilus latifrons, Sars, 1925, p. 295, pl. ci, figs. 1–14; Sewell, 1932, p. 323, text-fig. 106, *a–h*.

Occurence:

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 1 female, juv.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Distribution.—The North Atlantic Ocean (Sars), the Arabian Sea (present records), and the Laccadive Sea (Sewell).

Genus *Augaptilus* Giesbrecht (*sensu stricto*).

Augaptilus, Giesbrecht, 1892, p. 400; Giesbrecht and Schmeil, 1898, p. 120; Sars, 1925, p. 254; Sewell, 1932, p. 315.

Augaptilus longicaudatus (Claus).

Augaptilus longicaudatus, Giesbrecht, 1892, p. 400, pl. xxvii, fig. 31, pl. xxviii, figs. 11, 19, 23, 31, 35, 38, pl. xxix, fig. 22, pl. xxxix, figs. 37, 48; Sars, 1925, p. 256, pl. lxxvi, figs. 17, 18; Esterly, 1905, p. 188, fig. 41, *a–d*.

Occurrence:

Sta. 145 D, Maldive Area, 500–0 m. vertical, 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Remarks.—Farran has called attention to the great range in size in this species. In most instances the total length is about 3·5–4·3 mm. in the female; the present examples had a length of 3·667 mm. Off the Irish coast Farran obtained examples as large as 4·5–5·9 mm. which showed certain differences in the number of setæ on the terminal segments of the 2nd maxilliped. As no other points of difference were detected, he did not consider that these large forms could be regarded as a separate species.

Distribution.—The coast of Ireland (Farran), the North Atlantic (Sars, Lysholm and Nordgaard), the Mediterranean Sea (Claus, Pesta, Rose), the Gulf of Guinea (T. Scott), the South Atlantic Ocean (Wolfenden), the Arabian Sea and Maldive area (present records) the Malay Archipelago (A. Scott), the Australian Barrier Reefs (Farran), off New Zealand (Farran), the central area of the Pacific Ocean (Giesbrecht), and the San Diego region of the coast of California (Esterly).

Genus *Centraugaptilus* Sars.

Centraugaptilus, Sars, 1925, p. 304.

Centraugaptilus horridus (Farran).

Augaptilus horridus, Farran, 1909, p. 78, pl. viii, fig. 20.
Centraugaptilus horridus, Sars, 1925, p. 307, pl. cvii, figs. 11–18; Sewell, 1932, p. 326, text-fig. 107, *a–g*.
Augaptilus pyramidalis, Esterly, 1911, p. 334, pl. xxvi, figs. 1, 9; pl. xxx, fig. 69; pl. xxxii, fig. 106.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 2 females; 1500–0 m., 1 female.

Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.

Sta. 76, Gulf of Oman, 1500–0 m., 3 females.

REMARKS.—This species appears to exhibit a considerable variation in size. Farran's original example measures as much as 10 mm., and those of Sars from the North Atlantic 9·6 mm. Jespersen (1934, p. 114) gives the length of his example as only 7·5 mm. Esterly's specimen from the Pacific measured 6·68 mm. The male, taken by me in the Bay of Bengal, measured 8·4 mm., but the present females range from 6 to 7 mm. in length.

DISTRIBUTION.—South-west of Iceland (Jespersen), the west coast of Ireland (Farran), the North Atlantic Ocean near the Canary Islands and the Azores (Sars), the Arabian Sea and Gulf of Oman (present records), the Bay of Bengal (Sewell) and the east Pacific Ocean, San Diego region (Esterly, as *Augaptilus pyramidalis*).

Family ARIETELLIDÆ.

Genus *Arietellus* Giesbrecht.

Arietellus, Giesbrecht, 1892, p. 415; Giesbrecht and Schmeil, 1898, p. 124.

Arietellus giesbrechti Sars. (Text-fig. 63, A–M.)

Arietellus giesbrechti, Sars, 1925, p. 331, pl. cxix, figs. 1–6.
Arietellus sp., Farran, 1906, p. 82.

OCCURRENCE :

Sta. 131 D, Southern area of Arabian Sea, 500–0 m. vertical, 1 female.

Sta. 172, Central area of Arabian Sea, 200–0 m., 2 females; 400–0 m., 1 male.

DESCRIPTIVE NOTES.—♀. Total length, 5·16 and 5·53 mm.

The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
382	140	94	89	65	72	37	33	37	51 = 1000

The cephalothorax is an elongate oval, tapering somewhat anteriorly but not so markedly as in *A. setosus* or *A. aculeatus*. The forehead terminates anteriorly in a very small pointed process directed forwards and slightly downwards. The posterior thoracic margins extend backwards in a broad flap, which is produced at its apex in a spinous process that, viewed from the dorsal aspect, curves slightly inwards, and when seen from the side curves slightly upwards. The two sides appear to be symmetrical. The genital segment of the abdomen is as broad as long and is abruptly narrowed about half-way back. The furcal rami are nearly as broad as long and are densely haired on both inner and outer margins. In this respect the present specimens agree closely with Sars' description and figures of *A. giesbrechti*. Of the furcal setæ the 2nd is nearly twice the length of the others and is only sparsely haired; the 1st, 3rd, 4th and 5th setæ are all of approximately equal length and are very densely haired. The accessory seta is about half the length of the 1st seta, and, like the 2nd, is sparsely haired. The furcal setæ are of a dark auburn tint, shot with blue. The body is plentifully supplied with cutaneous glands, which are particularly numerous in the postero-lateral region of the fused 4th–5th thoracic segments (Text-fig. 63, A). In the lateral region of the 1st thoracic segment near the posterior margin lie 2 or 3 apertures; in the corresponding region of the 2nd thoracic segment is a group of 6; in the 3rd segment there is a group of 25 or 26; and on segments 4–5 the number has increased to over 100. A pair of pores is present in the dorso-lateral region of the anal segment, and 3 open on the dorsal aspect of the furcal ramus.

The 1st antenna (Text-fig. 63, B) reaches back to about the posterior margin of the thorax. The proportional lengths of the several segments are as follows:

Segment	1–2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12–13.	14.	15.	16.	17.	18.	19.	20.	21–25.	
	178	43	21	19	15	15	10	9	9	11	53	48	62	80	91	86	94	75	81	= 1000

Segments 1 and 2 are completely fused; segments 8, 9 and 10 are partly fused; segments 12 and 13 are also almost completely fused, and segments 21 to 25 are completely fused, and the surface of the combined segment is covered with very fine punctations.

The 2nd antenna (Text-fig. 63, C) and mouth parts (Text-fig. 63, D, E, G and H) agree closely with the appendages of *A. setosus*; in the 1st maxilla the endopod is represented by a small, rounded swelling.

The setal formula of the swimming legs is as follows:

	Endopod.			Exopod.					
				Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	2	5	1	1	4	1	1	2, 1
P. 2	1	2	8	1	1	5	1	1	3, 1
P. 3	1	2	8	1	1	5	1	1	3, 1
P. 4	1	2	7	1	1	5	1	1	3, 1

The 5th pair of legs have the characteristic form of the genus (Text-fig. 63, L).

♂. Total length, 4·67 mm.

The proportional lengths of the various segments of the body are as follows:

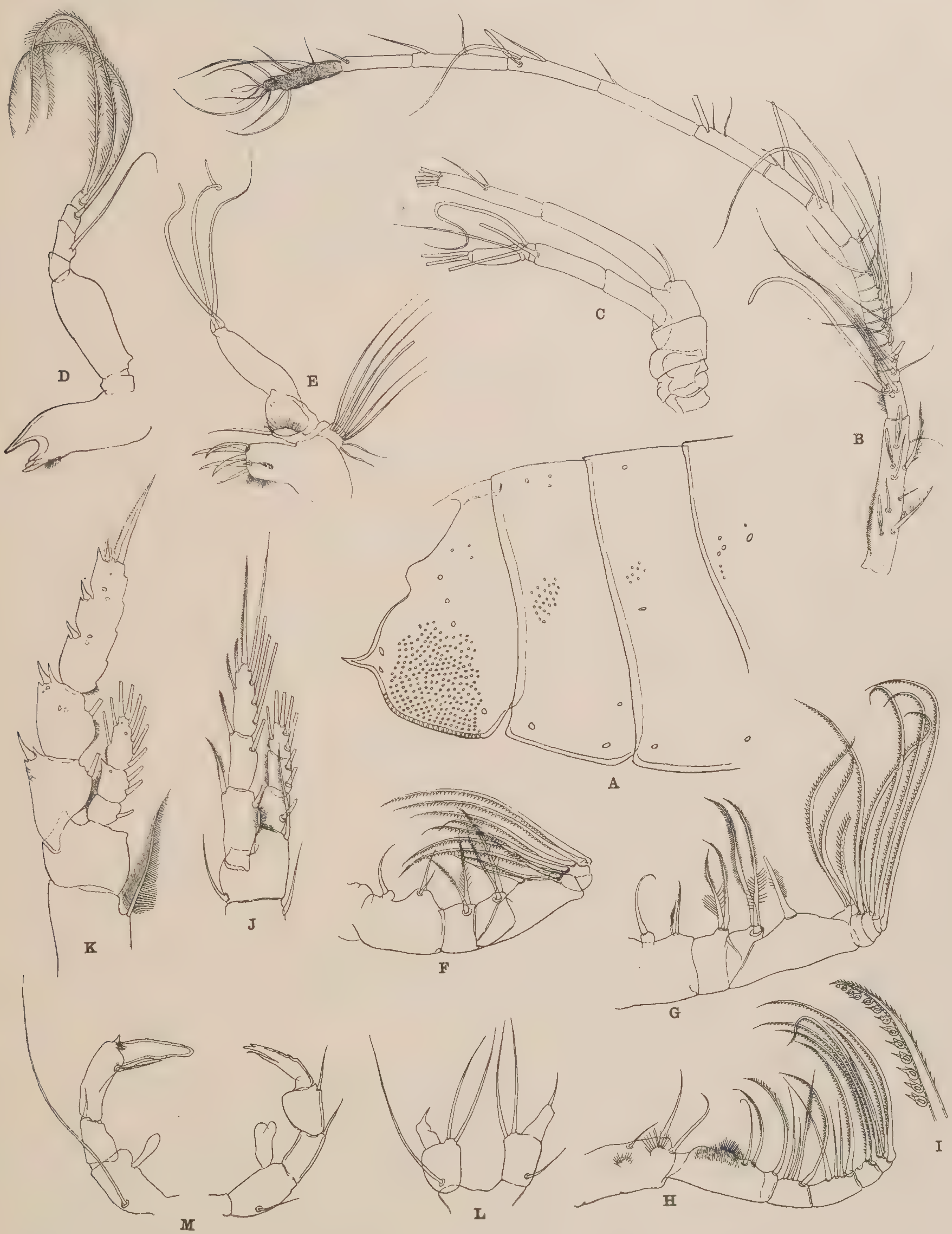
Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.	
381	143	88	85	64	51	31	31	28	37	61	= 1000

The general shape of the body resembles that of the female.

The left 1st antenna is modified to form a grasping organ, the segments of which have the following proportional lengths:

Segment	1–2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19–20.	21–25.	
	177	47	22	20	15	15	10	12	9	12	13	49	57	70	91	98	91	141	51	= 1000

The distal half of the fused 19–20 segment and the whole of the 21–25 segment are finely punctate. The structure of the antennæ and mouth parts appears to be identical with



TEXT-FIG. 63.—*Arietellus giesbrechti* Sars, A, Posterior thoracic segments, lateral view. B, 1st antenna, ♀. C, 2nd antenna, ♀. D, Mandible, ♀. E, 1st maxilla, ♀. F, 2nd maxilla, ♂. G, 2nd maxilla, ♀. H, Maxilliped, ♀. I, One of the spines, enlarged. J, 1st leg. K, 3rd leg. L, 5th pair of legs, ♀. M, 5th pair of legs, ♂.

those of *A. setosus*. The strong setæ arising from the distal portion of both the 2nd maxilla and the maxilliped bear a row of flattened platelets each terminating in a short spine, as figured by Esterly in *A. setosus* (*vide* Esterly, 1905, fig. 42, *c*).

The swimming legs resemble those of the female.

The 5th pair of legs (Text-fig. 63, M) appear to resemble those of *A. plumifer* Sars more nearly than the figure given by Sars for *A. giesbrechti*.

Distribution.—Sars described this species from the temperate region of the North Atlantic Ocean. Subsequently Farran (1906, p. 82) obtained a few specimens of a species that, while resembling *A. giesbrechti* rather closely, showed no signs of asymmetry in the body. It seems probable that the present specimens are conspecific with those obtained by Farran off the west coast of Ireland, and if these are examples of *A. giesbrechti*, the species occurs in the Arabian Sea.

Arietellus plumifer Sars.

Arietellus plumifer, Sars, 1925, p. 332, pl. cxix, figs. 7–11.

Occurrence.—Sta. 96, Central part of Arabian Sea, 645–400 m., 1 female, 2 males, juv.

Remarks.—These examples agreed exactly with Sars' description so far as the general shape of the body, the character of the furcal rami and the proportional lengths of the furcal setæ and their dense feathering are concerned.

Distribution.—Originally described by Sars from the North Atlantic Ocean between Portugal and the Azores and Canary Islands, the species has since been taken by Farran off the west coast of Ireland, and by Lysholm and Nordgaard in the North Atlantic as far as 60° N. lat. The present record extends its distribution to the Arabian Sea.

Arietellus simplex Sars.

Arietellus simplex, Sars, 1925, p. 334, pl. cxx, figs. 7–12.
Arietellus major, Esterly, 1906, p. 74, pl. ix, fig. 17, pl. xi, figs. 43, 44, pl. xii, fig. 56, pl. xiii, fig. 80.

Occurrence :

Sta. 96, Central area of Arabian Sea, 645–400 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

Distribution.—The San Diego region of the Californian coast (Esterly), the Malay Archipelago (A. Scott), the Laccadive Sea (Sewell), the Arabian Sea (present records), the tropical Atlantic Ocean (Wolfenden), near the Azores (Sars), and off the west coast of Ireland (Farran).

Genus *Phyllopus* Brady.

Phyllopus, Brady, 1883, p. 78; Giesbrecht and Schmeil, 1898, p. 124.

Phyllopus impar Farran.

Phyllopus impar, Farran, 1908, p. 84, pl. ix, figs. 1–4; A. Scott, 1909, p. 149, pl. xlv, figs. 10–18; Sars, 1925, p. 340, pl. cxxiii, figs. 1–17.

Occurrence.—Sta. 76, Gulf of Oman, 1500–0 m., 1 female.

Distribution.—South of Iceland in 60° N. lat. (Lysholm and Nordgaard), the west coast of Ireland (Farran), off Gibraltar and near the Azores (Sars), the tropical Atlantic (Wolfenden), the Gulf of Guinea (T. Scott, as *P. bidentatus*), the Gulf of Oman (present record) and the Malay Archipelago (A. Scott).

Phyllopus muticus Sars. (Text-fig. 64, A–J.)

Phyllopus muticus, Sars, 1925, p. 345, pl. cxxiv, figs. 10–16.

OCCURRENCE.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 male.

DESCRIPTIVE NOTES.—♂. Total length, 5·03 mm. This is slightly larger than the females described by Sars, which measured 4·80 mm. The proportional lengths of the cephalothorax and abdomen are as 63 to 37. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
290	113	68	68	100	65	64	61	55	55	61 = 1000

Viewed from above the forehead is somewhat truncated and the posterior margins of the 5th thoracic segment are also truncated. The furcal rami and furcal setæ agree exactly with Sars' description, the 2nd furcal seta on the left side being about half as long again as the other setæ, and the corresponding seta on the right side as much as two-and-a-half times their length.

The body is plentifully provided with the openings of numerous cutaneous glands, that appear to be of two kinds; first, comparatively large multicellular glands that open by large apertures, and second, small glands composed of only one or two cells, that open by small pores. The distribution of these glands and their apertures is shown in Text-fig. 64, A.

The 1st antenna is comparatively short, not reaching as far as the posterior thoracic margin. The proportional lengths of the segments in the two appendages are as follows:

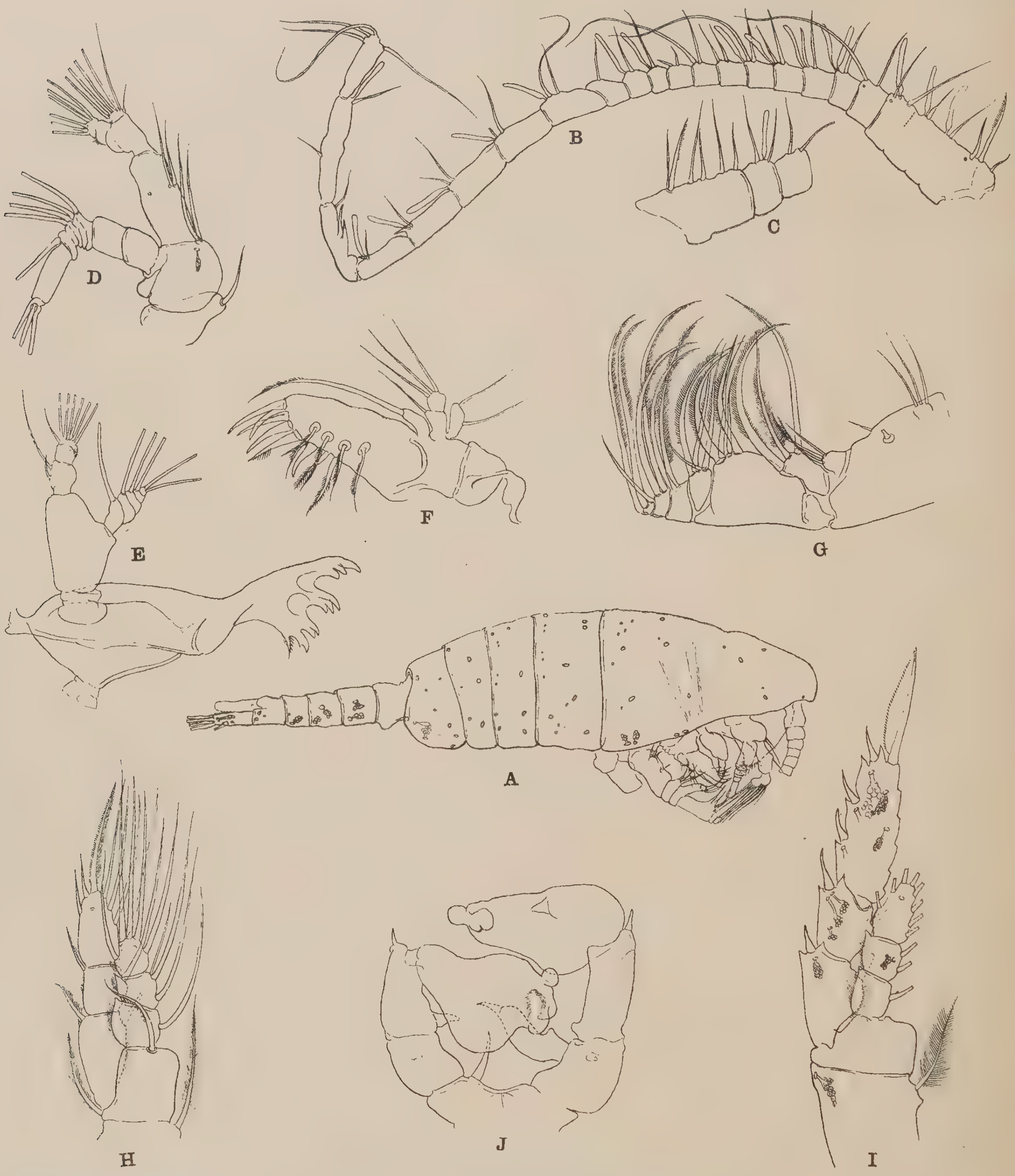
Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
Right	80	23	24	25	32	32	27	23	23	20	22	24	36	42	51	60	61	64
Left	112		33	33	37	38	34	22	26	20	22	25	21	59	64	75	73	62

Segment	19.	20.	21.	22.	23.	24–25.
Right	64	57	51	47	50	62 = 1000
Left	90		92			62 = 1000

In the stained specimen the 1st segment on the right side clearly shows traces of segmentation into three portions. In the left grasping antenna (Text-fig. 64, B) the 1st and 2nd segments are fused together; beyond the hinge-joint there are three separate joints, the first composed of the fused 19th and 20th segments, the second of the fused 21st–23rd segments and the terminal portion of the fused 24th–25th segments respectively.

The 2nd antenna (Text-fig. 64, D) closely resembles that of *P. impar* Farran. A gland opens on the inner side of the 2nd basal segment near the origin of the marginal setæ; and a smaller aperture is situated about the middle of the length of the 1st segment of the endopod opposite the origin of the two marginal setæ arising from that segment.

In the mandible (Text-fig. 64, E) the biting ramus agrees exactly with that of the female, as figured by Sars.



Text-fig. 64.—*Phyllopus muticus* Sars, ♂. A, Lateral view. B, 1st antenna, left side. C, Proximal segments of 1st antenna, right side. D, 2nd antenna. E, Mandible. F, 1st maxilla. G, 2nd maxilla. H, 1st leg. I, 3rd leg. J, 5th pair of legs.

The maxillæ (Text-fig. 64, F, G) and maxillipeds agree with those of the female.

The 1st swimming leg (Text-fig. 64, H) closely resembles that of *Phyllopus bidentatus* Brady, as figured by Giesbrecht (1892, pl. xviii, fig. 30). A gland opens on the 3rd segment of the exopod near the origin of the 1st marginal spine, and a similar gland opens on the 3rd segment of the endopod.

The 2nd, 3rd (Text-fig. 64, I) and 4th swimming legs are plentifully supplied with glands.

The 5th pair of legs (Text-fig. 64, J) has the same general character as the males of other species, but differs in details that are best seen in the figure.

DISTRIBUTION.—This species was described by Sars from the female that was taken in the North Atlantic Ocean near the Canary Islands. The occurrence of what I take to be the male in the present collection indicates that its range probably extends to the Arabian Sea.

Genus *Pachyptilus* Sars.

Pachyptilus, Sars, 1925, p. 318.

Pachyptilus eurygnathus Sars. (Text-fig. 65, A–F.)

Pachyptilus eurygnathus, Sars, 1925, p. 321, pl. cxiv, figs. 1–13.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 1 female; 1500–0 m., 2 females.
Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 6 females.
Sta. 76, Gulf of Oman, 1500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

REMARKS.—With the exception of one single feature all the above specimens agree with the description and figures given by Sars: this feature is the character of the endopod of the 1st pair of legs. Sars (*loc. cit.*, pl. cxiv, fig. 10) shows this ramus as consisting of three segments, whereas in the present specimens there are only two segments, as in *P. lobatus*.

DISTRIBUTION.—Up to the present time this species has been recorded solely from the North Atlantic Ocean (Sars) and the Arabian Sea and Gulf of Oman (present records).

Pachyptilus lobatus Sars.

Pachyptilus lobatus, Sars, 1925, p. 322, pl. cxv, figs. 1–14.

OCCURRENCE.—Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.

REMARKS.—This single specimen appears to agree exactly with the description and figures given by Sars.

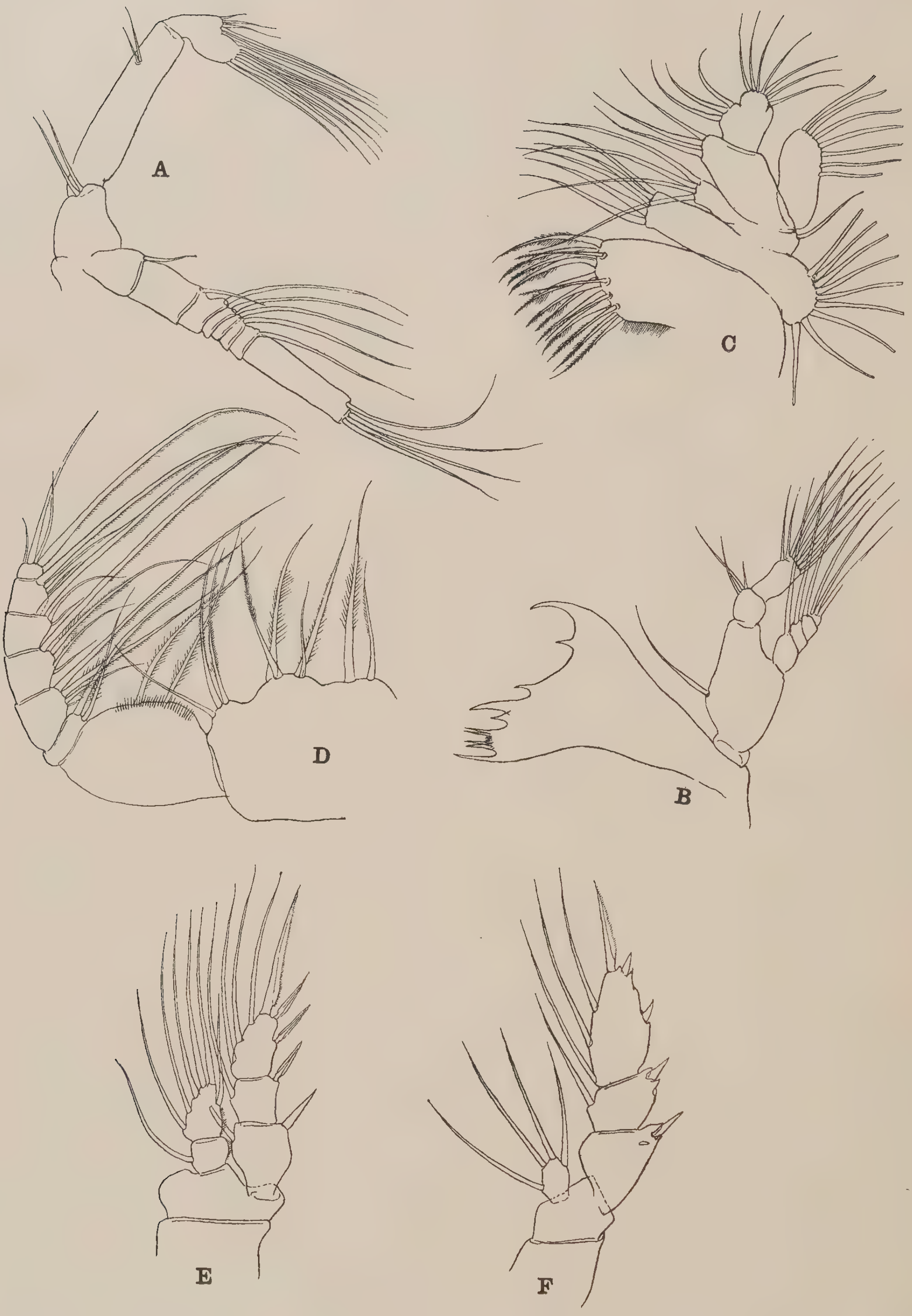
DISTRIBUTION.—Hitherto known only from the temperate region of the North Atlantic Ocean (Sars), the present record extends the distribution to the Arabian Sea.

Genus *Heteroptilus* Sars.

Heteroptilus, Sars, 1925, p. 324.

Heteroptilus acutilobus Sars. (Text-fig. 66, A–H.)

Heteroptilus acutilobus, Sars, 1925, p. 326, pl. cxvii, figs. 1–15.



Text-fig. 65.—*Pachyptilus eurygnathus* Sars, ♀. A, 2nd antenna. B, Mandible. C, 1st maxilla. D, Maxilliped. E, 1st leg. F, 5th leg.

Occurrence.—Sta. 186, Gulf of Aden, 575–0 m., 2 females.

Descriptive Notes.—♀. Total length, 4·517 mm.

The proportional lengths of the cephalothorax and abdomen are as 73 to 27. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
391	111	74	74	85	96	44	33	18	74 = 1000

The cephalon and 1st thoracic segment are separate. The forehead is rounded, and ventrally the head is produced in a downwardly directed curved prominence, the margin of which is irregularly crenated. There are no rostral filaments. The posterior thoracic margin is produced backwards in the lateral region in a sharp straight spine. The genital segment is produced ventrally in a well-marked eminence at about the middle of its length. The anal segment is short. The furcal rami are long and are about twice as long as broad; they are truncated distally and from this part arise four setæ, the 5th arising from the outer margin a little beyond the middle of the length of the ramus.

The 1st antenna reaches to the tip of the furcal ramus.

The proportional lengths of the various segments are as follows:

Segment 1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
87	18	18	18	22	20	20	20	22	25	29	32	54	55	58	59	59	57

19.	20.	21.	22.	23.	24.	25.
59	46	45	41	53	64	19 = 1000

The segments are provided with numerous long filaments.

In the 2nd antenna (Text-fig. 66, a) the exopod is considerably longer than the endopod in the proportion of 54 to 46. The exopod is composed of eight segments; the 1st and 2nd segments each bear a rather short delicate seta, but the setæ arising from the more distal segments are stouter and much longer.

The mandibles of the two sides differ; on the right side (Text-fig. 66, b) a long curved tooth projects forward from the anterior margin, and the right paragnath is equally produced in a corresponding long fleshy lobe. The 2nd basal segment bears a long seta on the inner margin.

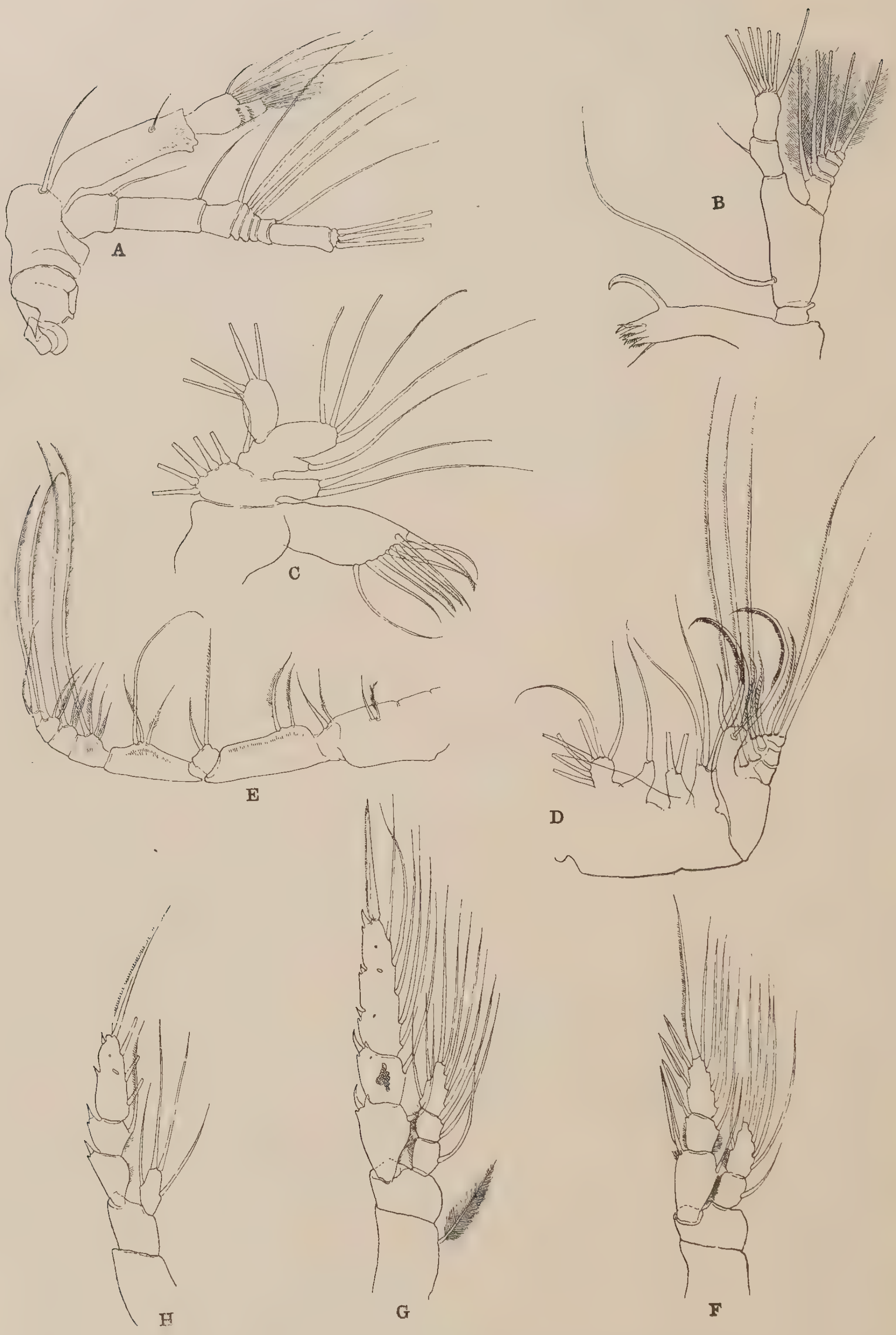
The 1st maxilla (Text-fig. 66, c) agrees with Sars' description and figures and the 2nd outer lobe bears a moderately stout seta.

The other appendages agree closely with the description and figures given by Sars.

The setal formula of the swimming legs is as follows:

	Endopod.			Exopod.					
				Inner.			Outer.		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
P. 1	1	6		1	1	4	1	1	2, 1
P. 2	1	2	7	1	1	5	1	1	3, 1
P. 3	1	2	7	1	1	5	1	1	3, 1
P. 4	1	2	6	1	1	5	1	1	3, 1
P. 5	4			0	1	3	1	1	2, 1

I have no hesitation in referring this example to Sars' species.



Text-fig. 66.—*Heteroptilus acutilobus* Sars, ♀. A, 2nd antenna. B, Right mandible. C, 1st maxilla. D, 2nd maxilla. E, Maxilliped. F, 1st leg. G, 3rd leg. H, 5th leg.

Distribution.—The Bay of Biscay (Farran), the temperate region of the North Atlantic Ocean (Sars) and the Gulf of Aden (present record).

Heteroptilus sp. (Text-fig. 67, A–J.)

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 male.

Descriptive Notes.—♂. Total length, 6·55 mm.

The proportional lengths of the cephalothorax and abdomen are as 75 to 25. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4–5.	Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
394	115	71	71	99	51	41	38	33	18	69 = 1000

The anterior region of the cephalon is similar to that of the female described above. The posterior thoracic margin of the 5th segment is produced backwards in a wing, the apex of which is rounded and bears a minute hair or seta.

The left 1st antenna (Text-fig. 67, A) is modified into a grasping organ. The proportional lengths of the various segments are as follows:

Segment	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
Right	78	12	15	15	17	17	17	17	19	22	27	32	52	54	54	59	63	65
Left	78	12	14	14	17	17	17	19	22	25	29	34	48	59	59	60	65	70

	19.	20.	21.	22.	23.	24.	25.
	65	52	52	52	56	73	15 = 1000
	140			113		72	16 = 1000

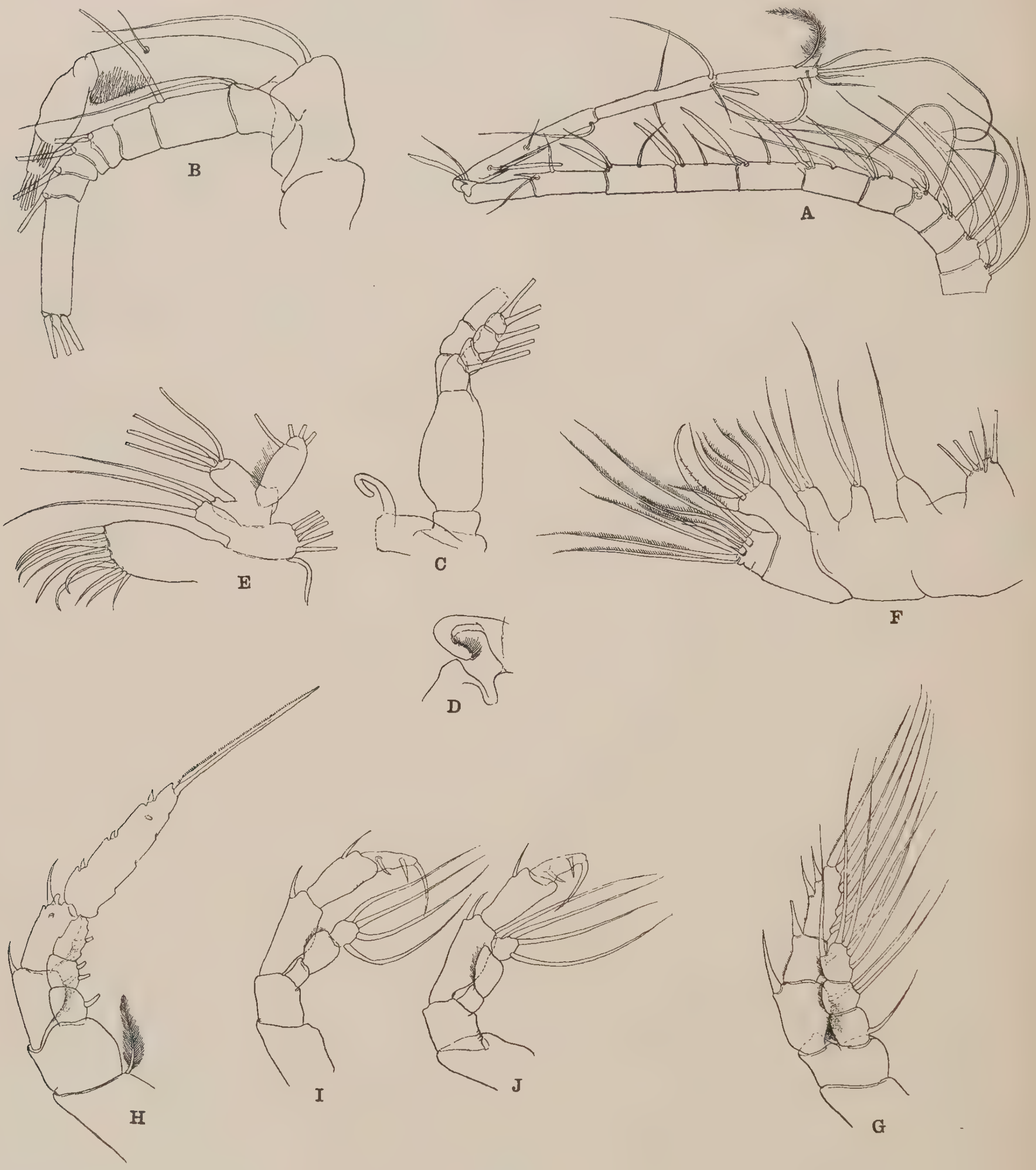
In the grasping antenna the middle segments are only very slightly, if at all, increased in size; the 17th segment is produced in a straight horizontal spine that overhangs the 18th segment. Segments 19 to 21 are fused together and the combined joint bears two straight spines, of which the distal is the longer. Segments 22 and 23 are fused, and 24 and 25 separate.

In the 2nd antenna (Text-fig. 67, B) the proportional lengths of the exopod and endopod are as 53 to 47.

The mandibles are asymmetrical. On the right side (Text-fig. 67, C) the biting ramus is produced on its anterior aspect in a long curved tooth, similar to that in the female *H. attenuatus*; in association with this tooth there is a curved tongue-like process from the lateral lip of the mouth on the right side (Text-fig. 67, D). Sars (1925, p. 325, pl. cxvi, fig. 8) has described and figured a similar projection in *H. attenuatus*, but he states that it is situated on the *left* side; this, I think, must be an error, for it seems to me that the hook-like tooth on the mandible and the palp-like process are in apposition with each other.

In the left mandible the biting ramus bears a series of five teeth and a seta; the 1st tooth is simple; the 2nd is bifid but has a straight posterior margin; the 3rd, 4th and 5th are bifid at their extremities and their posterior edges are armed with a row of spines. The basal segment of the palp bears a seta: the endopod arises from the segment considerably distal to the origin of the exopod, as in *Heteroptilus acutilobatus*.

The 1st maxilla (Text-fig. 67, E) closely resembles that of the female, described above, except that the seta arising from the 2nd outer lobe is small.



Text-fig. 67.—*Heteroptilus* sp., ♂. A, 1st antenna of left side. B, 2nd antenna. C, Mandibular palp and base of biting ramus of right side. D, Curved process on posterior lip of mouth. E, 1st maxilla. F, 2nd maxilla. G, 1st leg. H. 3rd leg. I, Right 5th leg. J, Left 5th leg.

In the 2nd maxilla (Text-fig. 67, F), the 1st lobe bears two groups of setæ; in the 1st group are two setæ, the distal of which is minute; in the 2nd group are 4 setæ, of which the 1st is much smaller than the others. The 2nd lobe bears a single seta. The 3rd lobe has 2, and the 4th lobe, 3 setæ. The 5th lobe bears 6 setæ, of which four are serrated, and the 6th is a stout curved spine with a few teeth on its margin. The 1st and 2nd segments of the endopod bear two setæ, one short and curved and the other straight; both are serrated along one margin. The 3rd segment bears 3 straight, serrated setæ.

The maxilliped appears to resemble that of *H. acutilobus.*

In the 1st swimming leg (Text-fig. 67, G) the endopod consists of three segments, whereas in the females of both *H. attenuatus* and *H. acutilobus* there are only two. Unfortunately Sars neither describes nor figures the 1st leg in the male of *H. acutilobus*, but, as he makes no mention of any difference, it is to be presumed that in that species the endopod resembles that of the female and is composed of two segments only.

The 2nd, 3rd and 4th legs are normal in structure, both rami being composed of three segments. The 3rd segment of the exopod shows a slight difference from the condition seen in *H. acutilobus* ♀. The distal marginal spine, instead of being situated at the external distal angle, arises from the outer margin at a point about $\frac{4}{5}$ths the length of the segment. The external marginal spines arising from exopod 1 and 2 are much longer than in *H. acutilobus* ♀.

The 5th pair of legs is symmetrical (Text-fig. 67, I and J). The exopod is composed of three segments, of which the 1st and 2nd each bear a single marginal spine and the 3rd segment bears two marginal spines and a terminal spine. There are no setæ on the inner margin of any of the segments. The endopod is composed of three segments, of which the 1st and 2nd are devoid of a seta and the 3rd segment bears 4 setæ.

In its general appearance this specimen somewhat resembles the female of *H. attenuatus* Sars and may perhaps be the unknown male of that species, but, as the number of segments in the swimming legs differs, I cannot definitely refer it to that species.

DISTRIBUTION.—The Arabian Sea (present record).

Family CANDACIIDÆ.

Genus *Candacia* Dana.

Candacia, Giesbrecht, 1892, p. 423; Giesbrecht and Schmeil, 1898, p. 126.

Candacia æthiopica (Dana).

Candacia ethiopica, Giesbrecht, 1892, p. 424, pl. iv, fig. 13, pl. xxi, figs. 1, 9, pl. xxii, figs. 1, 6, 13, 14, 32, 40, pl. xxix, figs. 7, 11, 13.

Candacia aethiopica, Esterly, 1905, p. 196, fig. 47 *a–h.*

OCCURRENCE:

Sta. 61 C, Northern area of Arabian Sea, surface, 120 specimens.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female; 1500–0 m., 1 female.
Sta. 145 C, Maldive area, 50–0 m. vertical, 1 female, 1 male.
Sta. 145 D, Maldive area, 50–0 m., vertical, 1 female.

DISTRIBUTION.—The San Diego region of the Californian coast (Esterly), the Pacific Ocean (Dana, Giesbrecht, Streets), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), the coast of S. Burma (Sewell), the Bay of Bengal (Thompson, Cleve), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Laccadive Sea and Arabian Sea (Thompson and A. Scott, A. Scott, present records), the Red Sea (Thompson and A. Scott), the South Atlantic Ocean, west of Cape Colony (Wolfenden), the south temperate Atlantic (Farran), tropical North Atlantic Ocean (Giesbrecht, Wolfenden), the temperate North Atlantic Ocean (T. Scott, Farran, Sars, Rose) and the Mediterranean Sea (Claus, Pesta, Rose).

Candacia bipinnata Giesbrecht.

Candacia bipinnata, Giesbrecht, 1892, p. 424, pl. xxii, fig. 20, pl. xxxix, figs. 27, 29; Esterly, 1905, p. 195, fig. 45, *a–c*; Rose, 1929, p. 40, pl. ii, fig. 6, pl. iii, fig. 6.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 4 females; 1500–0 m., 2 females.

DISTRIBUTION.—The San Diego region of the Californian coast (Esterly), the western Pacific Ocean between 29° N. and 3° S. (Giesbrecht), off New Zealand (Farran), the south-east part of the Indian Ocean, Abrolhos Islands (Giesbrecht), the southern area of the Arabian Sea (present record), off South Africa (T. Scott, Cleve), the tropical South Atlantic Ocean off Rio de Janeiro (Farran), the north temperate Atlantic Ocean (Farran) and the western part of the Mediterranean Sea (Rose).

Candacia bispinosa (Claus).

Candacia bispinosa, Giesbrecht, 1892, p. 424, pl. xxi, figs. 6, 7, 16, 27, pl. xxii, figs. 4, 8, 22, 33, 35, 38, 39, pl. xxxix, figs. 15–17, 20.

OCCURRENCE.—Sta. 145 C, Maldive area, 50–0 m., vertical, 1 female.

DISTRIBUTION.—The Pacific Ocean between 16° and 20° N. (Giesbrecht), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), the Bay of Bengal (Sewell), the Maldive area (present record), the Gulf of Aden (A. Scott), the Red Sea (Thompson and A. Scott), the South-west part of the Indian Ocean (Wolfenden), the South Atlantic Ocean (T. Scott, Wolfenden), Tropical Atlantic (Wolfenden, Farran), temperate North Atlantic Ocean (T. Scott, Farran, Sars), and the Mediterranean Sea (Claus, Thompson, Thompson and A. Scott, A. Scott, Sars, Pesta, Rose).

Candacia curta (Dana).

Candacia curta, Giesbrecht, 1892, p. 424, pl. xxi, fig. 15, pl. xxii, figs. 2, 24, pl. xxxix, figs. 8–10, 12; Esterly, 1905, p. 196, fig. 46, *a–c*.

OCCURRENCE:

Sta. 61 C, Southern area of Arabian Sea, surface, 120 specimens.
Sta. 76, Gulf of Oman, 200–0 m., 4 females; 1500–0 m., 2 females.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female, 1 male.
Sta. 172, Central area of Arabian Sea, 200–0 m., 1 male.

DISTRIBUTION.—The San Diego region of the Californian coast (Esterly), the west coast of South America to 50° S. (Giesbrecht, Dana), the eastern Pacific (Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott), the Arabian Sea and Gulf of Oman (Thompson and A. Scott, Cleve, present records), the Gulf of Aden (Thompson and A. Scott), the Red Sea (Giesbrecht, Cleve, Thompson and A. Scott), east of Cape Colony (Cleve), the Gulf of Guinea (T. Scott. as *C. intermedia*), the South Atlantic Ocean (Giesbrecht, Wolfenden), and the tropical region of the Atlantic Ocean (T. Scott, Farran).

Candacia longimana Claus.

Candacia longimana, Giesbrecht, 1892, p. 424, pl. xxi, figs. 5, 18, pl. xxii, figs. 5, 7, 15, 26, 34, 36, pl. xxxix, figs. 4–6, 18, 19.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 3 males.

DISTRIBUTION.—The western Pacific Ocean (Giesbrecht), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), the Arabian Sea (Thompson, present record), the Gulf of Aden and Red Sea (Thompson and A Scott), the east side of the North Atlantic Ocean (Sars) and the Mediterranean Sea (Pesta, Rose). Rose (1929, p. 39) gives the northern limit of its distribution in the Atlantic as the Gulf of Gascony.

Candacia pachydactyla (Dana).

Candacia pachydactyla, Giesbrecht, 1892, p. 424, pl. xxi, fig. 17, pl. xxii, figs. 11, 19, pl. xxxix, figs. 30–33; Wilson, 1932, p. 141, fig. 96, *a*, *b*.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 61 C, Northern area of Arabian Sea, surface, 1 female.
Sta. 131 D, Southern area of Arabian Sea 500–0 m., 2 females, 1 male; 1500–0 m., 2 females, 1 male.
Sta. 135, Maldive area, surface, 1 male.
Sta. 145 C, Maldive area, 50–0 m. vertical, 3 females; 300–0 m. vertical, 2 females, 1 male.
Sta. 145 D, Maldive area, 100–0 m., vertical, 1 male; 500–0 m. vertical, 1 female.
Sta. 172, Central area of Arabian Sea, 200–0 m., 1 male; 400–0 m., 2 females, 1 male; 850–0 m., 1 male.

DISTRIBUTION.—The east Pacific Ocean (Giesbrecht), the south China Sea, off New Holland, the Philippine Islands and Fiji (Brady), the Malay Archipelago (A. Scott), the Aru Archipelago (Früchtl), the coast of South Burma (Sewell), Nankauri Harbour, Nicobar Islands (Sewell), Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden, present records), the Arabian Sea (Thompson and A. Scott), east of Cape Colony (Cleve), west of Cape Colony (Cleve), Gulf of Guinea (T. Scott), the south Atlantic Ocean (Brady, Giesbrecht, Wolfenden, T. Scott), the equatorial and north Atlantic Ocean (Lubbock, Giesbrecht, Wolfenden, Farran, Sars, Rose), the Woods Hole region of the American coast (Wilson) and the Mediterranean Sea (Thompson).

Candacia simplex (Giesbrecht).

Candacia simplex, Giesbrecht, 1892, p. 424, pl. xxi, figs. 10, 30, 31, pl. xxii, figs. 21, 29, pl. xxxix, figs. 3, 14.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m., 1 female.

DISTRIBUTION.—The Pacific Ocean (Giesbrecht), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott, Sewell), the Indian Ocean (Cleve), the Arabian Sea (Thompson and A. Scott, present record), the

Red Sea (Thompson and A. Scott), the tropical Atlantic Ocean (Wolfenden, Farran), the North Atlantic Ocean (Wolfenden, T. Scott) and the Mediterranean Sea (Thompson and A. Scott, Pesta, Rose).

Candacia varicans Giesbrecht.

Candacia varicans, Giesbrecht, 1892, p. 424, pl. xxi, figs. 3, 4, 11, pl. xxii, figs. 10, 25, pl. xxxix, figs. 2, 23.

OCCURENCE :

Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 1 female.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female.

DISTRIBUTION.—Off New Zealand (Farran), the Laccadive Sea (Sewell), the Arabian Sea (present records), the east coast of South Africa (Cleve), the South Atlantic Ocean (Wolfenden), the Gulf of Guinea (T. Scott), the tropical Atlantic (Wolfenden), the temperate North Atlantic Ocean (Farran) and the Mediterranean Sea (Giesbrecht).

Family PONTELLIDÆ.

Genus *Calanopia* Dana.

Calanopia, Giesbrecht, 1892. p. 441 ; Giesbrecht and Schmeil, 1898, p. 131.

Calanopia elliptica (Dana).

Calanopia elliptica, Giesbrecht, 1892, p. 441, pl. xxxi, figs. 23–26, 31, 32, pl. xxxviii, figs. 42, 47 ; *idem*, 1896, p. 325, pl. v, figs. 7–9 ; A. Scott, 1909, p. 176, pl. xlviii, figs. 1–5.

OCCURRENCE.—Sta. 56, South Arabian Coast, surface, 2 males.

DISTRIBUTION.—In the Western Pacific from Hong Kong (Giesbrecht), the Philippine Islands (Brady), the Great Barrier Reefs of Australia (Farran), the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean from the coast of Southern Burma, Nankauri Harbour, Nicobar Islands, and the Bay of Bengal (Sewell), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Cleve, A. Scott), the Persian Gulf (Pesta), the south coast of Arabia (present record), the Red Sea (Thompson, Giesbrecht, A. Scott), the Suez Canal (Gurney), the east coast of Africa (Thompson) and in the Mediterranean Sea (Thompson).

Genus *Labidocera* Lubbock.

Labidocera, Giesbrecht, 1892, p. 444 ; Giesbrecht and Schmeil, 1898, p. 132.

Labidocera acuta (Dana).

Pontella acuta, Brady, 1883, p. 89, pl. xxxvi, figs. 1–12.
Labidocera acutum, Giesbrecht, 1892, p. 445, pl. xxiii, figs. 15, 44, 46, pl. xxv, figs. 31, 33, pl. xli, figs. 10, 19, 20, 28, 29, 40.

OCCURRENCE :

Sta. 45, South Arabian Coast, 38 m., 1 male.
Sta. 56, South Arabian Coast, surface, 3 females, 57 males.
Sta. 58, South Arabian Coast, surface, 11 specimens.
Sta. 76, Gulf of Oman, 200–0 m., 6 females, 2 males ; 600–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 2 females, 2 males.

Distribution.—The Californian coast of America (Giesbrecht), the western region of the Pacific Ocean (Giesbrecht), the south-west Pacific Ocean (Dana, Brady), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott), the Aru Archipelago (Früchtl), the coast of southern Burma and Nankauri Harbour, Nicobar Islands (Sewell), the Bay of Bengal (Thompson), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Indian Ocean (Giesbrecht), the Arabian Sea (Pesta, present records), the Persian Gulf (Pesta), the Red Sea (Giesbrecht, A. Scott), the east coast of Africa (Wolfenden, Brady, Thompson), the Agulhas current (Cleve), the Gulf of Guinea (T. Scott), the Altantic, Ocean (van Breemen) and Port Erin, Isle of Man (Thompson).

Labidocera acutifrons (Dana).

Labidocera auctifrons, Giesbrecht, 1892, p. 445, pl. xxiii, figs. 2, 12, 30, 33, 40, 41, pl. xli, figs. 3, 26, 4L; Wilson, 1932, p. 145, fig. 98, *a–d*.

Occurrence:

Sta. 56, South Arabian Coast, surface, 2 females, 1 male.
Sta. 58, South Arabian Coast, surface, 1 male.

Distribution.—Off the west coast of South America and in the eastern Pacific region between 110°–147° W., 25°–30° N. (Giesbrecht), in the western Pacific area off New Holland, the Philippine Islands, Sandwich Islands and Ki Islands (Brady), the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl), the Arabian Coast (present records), the west region of the Indian Ocean (Thompson), the Antarctic Ocean (Wolfenden), the Gulf of Guinea (T. Scott), the tropical Atlantic (Farran, Giesbrecht), the North Atlantic (T. Scott), in the Woods Hole region (Wilson), off Cape Verde Islands (Brady) and in the western part of the Mediterranean Sea (Giesbrecht.)

Labidocera detruncata (Dana).

Pontella detruncata, Brady, 1883, p. 90, pl. xxvi, figs. 8–15, pl. xlv, fig. 20.
Labidocera detrcunatum, Giesbrecht, 1892, p. 445, pl. xxiii, figs. 14, 34, pl. xxv, fig. 28, pl. xli, figs. 9, 30, 31; Wolfenden, 1906, p. 1017, pl. xcviii, figs. 18, 21, 34, 36.

Occurrence:

Sta. 61 A, Northern area of Arabian Sea, 2000–0 m., 2 females, 1 male.
Sta. 61 C, Northern area of Arabian Sea, surface, 3291 specimens; 1000–0 m., 11 females, 11 males; 1500–0 m., 2 males.

Distribution.—Pacific Ocean, 110° W., 10° S. (Streets), south of the Hawaian Islands (Brady), 175° E. to 178° W., 0°–26° S. (Dana), South China Sea (Giesbrecht), Australian Barrier Reefs (Farran), Malay Archipelago (A. Scott), Nankauri Harbour, Nicobar Islands, and Bay of Bengal (Sewell), the Indian Ocean 45°–75° E. (Giesbrecht), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present records) and Durban Bay (Brady). A variety of this species, var. *intermedia*, was recorded by T. Scott from the Gulf of Guinea.

Labidocera minuta Giesbrecht.

Labidocera minuta, Giesbrecht, 1892, p. 446, pl. xxiii, figs. 16, 35, 36, pl. xxv, fig. 32, pl. xli, figs. 8, 15, 16, 35.

Occurrence.—Sta. 56, South Arabian Coast, surface, 12 males, 1 female.

Distribution.—Hong Kong (Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott, Früchtl), the coast of southern Burma and the Mergui Archipelago (Sewell), Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (A. Scott, Cleve, present record), the Persian Gulf (Pesta), the Red Sea (Giesbrecht, A. Scott) and the Suez Canal (Gurney).

Genus *Pontella* Dana.

Pontella, Giesbrecht, 1892, p. 461 ; Giesbrecht and Schmeil, 1898, p. 139.

Pontella fera Dana.

Pontella fera, Giesbrecht, 1892, p. 462, pl. xxiv, figs. 14, 31, 34, 36, pl. xl, figs. 15, 18, 27, 36.

Occurrence.—Sta. 172, Central area of Arabian Sea, 400–0 m., 1 male.

Distribution.—The western region of the Pacific Ocean (Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Laccadive Sea (Giesbrecht), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present record), the Red Sea (A. Scott), the South Atlantic Ocean, west of Cape Colony (Wolfenden).

Pontella securifer Brady.

Pontella securifer, Brady, 1883, p. 96, pl. xlv, figs. 1–9 ; Giesbrecht, 1892, p. 461, pl. xxiv, figs. 9, 37, 41, 43, pl. xl, figs. 6, 14, 21, 32, 34 ; Wilson, 1932, p. 151, fig. 102, *a–c*.
Pontella spinipes, ♂, Wolfenden, 1906, p. 1020.

Occurrence :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 3 females ; 1500–0 m., 1 female, 1 juv.
Sta. 61 C, Northern area of Arabian Sea, surface, 59 females, 21 males.
Sta. 76, Gulf of Oman, 1500–0 m., 1 female.
Sta. 172, Central area of Arabian Sea, 200–0 m., 1 female ; 850–0 m., 1 female.
Sta. 186, Gulf of Aden, 250–0 m., 1 female.

Remarks.—The present specimens of the male agree closely with the description given by Wolfenden (1906) of the male that he attributed to *P. spinipes*.

Distribution.—In Puget Sound on the West Coast of North America (Thompson), the tropical area of the Pacific Ocean (Brady, Giesbrecht), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott), the coast of Southern Burma (Sewell), Nankauri Harbour, Nicobar Islands (Sewell), the Madras Coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden, Thompson and A. Scott), the Arabian Sea and Gulf of Oman (present records), east of South Africa (Cleve), Simon's Bay, Cape Colony (Wolfenden), the South Atlantic Ocean (T. Scott), the Gulf of Guinea (T. Scott), the Woods Hole region of North America (Wilson), and the Mediterranean Sea (Thompson).

Genus *Pontellopsis* Brady.

Monops, Giesbrecht, 1892, p. 486.
Pontellopsis, Giesbrecht and Schmeil, 1898, p. 145.

Pontellopsis armata (Giesbrecht).

Monops armata, Giesbrecht, 1892, p. 487, pl. xxvi, figs. 19, 26, 27, pl. xli, figs. 46, 47, 58.

OCCURRENCE.—Sta. 172, Central part of Arabian Sea, 850–0 m., 1 female.

DISTRIBUTION.—The western Pacific Ocean in lat. 10° N., long. 137° E. (Giesbrecht), the Malay Archipelago (Cleve, A. Scott), Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Laccadive Sea (Giesbrecht), the Maldive Archipelago (Wolfenden) and the Arabian Sea (present record).

Pontellopsis perspicax (Dana).

Monops perspicax, Giesbrecht, 1892, p. 486, pl. xxvi, figs. 15, 30, pl. xli, figs. 44, 49, 55, 59.
Pontellopsis perspicax, Giesbrecht and Schmeil, 1898, p. 147.

OCCURRENCE.—Sta. 172, Central area of Arabian Sea, 200–0 m., 1 female.

DISTRIBUTION.—The Malay Archipelago (A. Scott), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Arabian Sea (present record), in the tropical Atlantic south of the equator (Farran), the equatorial Atlantic (Dana, Giesbrecht) and in the North Atlantic to lat. 13° N. (T. Scott).

Pontellopsis regalis (Dana).

Monops regalis, Giesbrecht, 1892, p. 486, pl. i, fig. 6, pl. xxvi, figs. 3, 6–9, 13, 14, 20, 21, pl. xli, figs. 50, 54, 56, 62, 64, 66, 67.
Pontellopsis regalis, Giesbrecht and Schmeil, 1898, p. 147.

OCCURRENCE :

Sta. 61 C, Northern part of Arabian Sea, 1500–0 m., 1 male.
Sta. 145 D, Maldive Area, 500–0 m., vertical, 1 female.
Sta. 172, Central area of Arabian Sea, 850–0 m., 1 female.

DISTRIBUTION.—The west coast of South America (Giesbrecht), Hong Kong (Giesbrecht), Sulu Sea (Dana), the south-west Pacific Ocean between Sydney, Australia and Wellington, New Zealand (Brady), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott), the coast of Southern Burma, Nankauri Harbour, Nicobar Islands (Sewell), the Bay of Bengal (Thompson), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive area and the Arabian Sea (present records), the tropical Atlantic Ocean (T. Scott, Farran, Lubbock, Wolfenden), the Woods Hole region (Wilson) and the Mediterranean Sea and Adriatic (Pesta).

Genus *Pontellina* Dana.

Pontellina plumata (Dana).

Pontellina plumata, Giesbrecht, 1892, p. 497, pl. iv, fig. 11, pl. xxv, figs. 4, 18, 26, 36, pl. xl, figs. 49–53 ; Giesbrecht and Schmeil, 1898, p. 149.

OCCURRENCE.—Sta. 61 C, Northern area of Arabian Sea, surface.

Distribution.—The west coast of America between lats. 9° S. and 15° N. (Giesbrecht), Fiji and the Philippine Islands (Brady), off New Zealand (Farran), the Great Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott, Lubbock), the Aru Archipelago (Früchtl), the coast of Southern Burma (Sewell), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present record), the Red Sea (A. Scott), the east coast of Africa and the Agulhas Current (Cleve), off the Cape of Good Hope (Dana), the South Atlantic Ocean (Farran), the Brazil current (Cleve), the Gulf of Guinea (T. Scott), the tropical Atlantic Ocean (T. Scott, Farran), the Woods Hole region (Wilson), the north temperate Atlantic (Farran, Sars, Rose), and the Mediterranean Sea (Sars, Rose, Thompson)

Family Acartiidæ.

Genus *Acartia* Dana.

Acartia, Steuer, 1923.

Sub-genus *Acanthacartia* Steuer.

Acartia (*Acanthacartia*) *pietschmani* Pesta.

Acartia pietschmani, Pesta, 1912, p. 54, fig. 18, *a–d*.
Acartia (*A anthacartia*) *pietschmani*, Steuer, 1923, p. 109.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, 1 female.

Distribution.—The Great Barrier Reefs (Farran), the Ceylon Pearl Banks (Sewell), the Arabian Sea (Pesta, present record), and the Persian Gulf (Pesta).

Sub-genus *Odontacartia* Steuer.

Acartia (*Odontacartia*) *amboinensis* Carl.

Acartia amboinensis, ♂, Carl, 1907, p. 12, pl. i, figs. 3–5 ; ♀, Sewell, 1914, p. 242, pl. xix, figs. 1–7.
Acartia (*Odontacartia*) *amboinensis*, Steuer, 1923, p. 120, figs. 151–156.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, several specimens of both sexes.

Distribution.—The Malay Archipelago (Carl), the coast of Southern Burma (Sewell), the Ceylon Pearl Bank (Sewell), the northern area of the Arabian Sea (present record) and the entrance to the Gulf of Aden (Steuer).

Acartia (*Odontacartia*) *erythræa* Giesbrecht.

Acartia erythræa, Giesbrecht, 1892, p. 508, pl. xxx, figs. 5, 19, 32, pl. xliii, figs. 12, 13.
Acartia (*Odontacartia*) *erythræa*, Steuer, 1923, p. 118, figs. 142–145.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface.

Distribution.—The Malay Archipelago (Cleve, A. Scott, Carl), the Aru Archipelago (Früchtl), off Penang (Sewell), the coast of southern Burma, Nankauri Harbour, Nicobar Islands (Sewell), the coast of Madras (Menon), the Ceylon Pearl Banks (Thompson and A. Scott, Sewell), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Pesta, Cleve, present record), the Persian Gulf (Pesta), the Red Sea (Giesbrecht, A. Scott) and Durban Bay, East Africa (Brady).

CYCLOPOIDA.

Section GNATHOSTOMA.

Family OITHONIDÆ.

Sub-family OITHONINÆ.

Genus *Oithona* Baird.

Oithona attenuata Farran.

Oithona attenuata, Farran, 1913, p. 187, pl. xxx, figs. 3–7; Rosendorn, 1917, p. 42, text-fig. 25, *a–h*; Kiefer, 1929, p. 8.
Oithona attenuata, var. *latithoracica*, Früchtl, 1924, p. 71, figs. 47, 48.
Oithona attenuata, var. *latithoracica* f. *trisetosa*, Früchtl, 1924, p. 73.

OCCURRENCE.—"Investigator" collections, Expedition Harbour, Camorta Island, Nicobars, several specimens.

REMARKS.—So far as I was able to make out, these examples agreed with the description given by Farran.

DISTRIBUTION.—The Pacific Ocean, Pago Pago Harbour, Samoa (Rosendorn), the Australian Barrier Reefs (Farran), the Indian Ocean, off Christmas Island (Farran), in the Nicobar Islands (present record), near the Maldive Archipelago and in the south-west part of the Arabian Sea (Rosendorn) and near the Cape of Good Hope (Rosendorn). It also occurs sporadically in the Atlantic Ocean according to Rosendorn.

Oithona brevicornis Giesbrecht.

Oithona brevicornis, Giesbrecht, 1892, p. 546, pl. xxxiv, figs. 6, 7; Rosendorn, 1917, p. 34, text-fig. 19, *a–g*, 20, *a–f*; Kiefer, 1929, p. 8.
Oithona brevicornis, f. *aruensis*, Früchtl, 1924, p. 66, fig. 44.
Oithona brevicornis, f. *arostrata*, Früchtl, 1924, p. 69, figs. 45, 46.

OCCURRENCE.—Sta. 56, Coast of Southern Arabia, surface.

REMARKS.—This species, like *Oithona nana*, possesses a great degree of tolerance to brackish water.

DISTRIBUTION.—In the Pacific Ocean off Hong Kong (Giesbrecht), in the Malay Archipelago (Cleve), the Aru Archipelago (Früchtl), Verlaten Island, Sunda Straits (Sewell), Kurau River, Malay States, mouth of the Hoogli River, Calcutta Salt Lakes, Chilka Lake (Sewell), the tropical Atlantic Ocean (Cleve), east coast of North America, Chesapeake Bay (Wilson), Penzance Ponds, Woods Hole (Wilson) and in the Adriatic Sea (Pesta).

Oithona fallax Farran.

Oithona fallax, Farran, 1913, p. 185, pl. xxvii, figs. 9–12, pl. xxviii, figs. 1–3; Rosendorn, 1917, p. 27, text-figs. 14, *a*, *b*, 15, *a–h*; Kiefer, 1929, p. 7.

OCCURRENCE.—Sta. 61 C, Northern area of Arabian Sea, surface, 2 females.

DESCRIPTIVE NOTES.—♀. Total length 0·87 mm. The proportional lengths of the anterior and posterior regions of the body are as 49 to 38; Farran gives 48 to 42 and

Rosendorn 47 to 42. The proportional lengths of the segments of the posterior region are as follows:

Segment.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	15	31	15	15	14	10 = 100

The outer furcal seta is twice the length of the furcal ramus.

The present examples both differ from the description given by Farran in that the terminal segment of the endopod of the 1st leg bears 6 inner setæ and 1 outer seta—7 in all; whereas Farran states that in his specimens there were five inner edge setæ and 1 outer; he, however, shows 7 setæ in all in his figure. A small very delicate seta is present on the inner margin of the 1st segment of the exopod of the 1st leg in these examples.

Distribution.—Off Christmas Island (Farran), the Indian Ocean, Arabian Sea and the Agulhas Current (Rosendorn), the northern area of the Arabian Sea (present record) and in the south temperate and tropical parts of the Atlantic Ocean (Rosendorn).

Oithona nana Giesbrecht.

Oithona nana, Giesbrecht, 1892, p. 538, pl. iv, fig. 8, pl. xxxiv, figs. 10, 11, 20, 24–26, 34, 35; Rosendorn, 1917, p. 40, text-fig. 24, *a–d*; Gurney, 1927, p. 159; Pesta, 1928, p. 76, fig. 58; Kiefer, 1929, p. 9.

Occurrence.—Sta. 56, South coast of Arabia, surface.

Remarks.—Sars (1913–18, p. 207) has suggested that *Oithona helgolandica* Claus and *O. nana* Giesbrecht are synonyms; Rosendorn (1917) apparently inclines to this view, and Pesta (1928) has adopted it. If this be the case, then Claus' name *helgolandica* has priority.

Gurney (1927) has suggested that there are two forms of this species, a northern, smaller form, measuring 0·53–0·55 mm., and a southern, larger form, measuring 0·62–0·69 mm. The present forms measured 0·56 mm.

Distribution.—East Pacific, San Diego Region (Esterly), the south-west Pacific Ocean, Samoa (Rosendorn), the Malay Archipelago (Cleve), the Aru Archipelago (Früchtl). Kurau River, Malay States (Sewell), Indian Ocean, Christmas Island (Farran), Ceylon Pearl Banks (Thompson and A. Scott), Nankauri Harbour, Nicobar Islands (Sewell), the Maldive Archipelago (Wolfenden), the Chilka Lake (Sewell), the Arabian Sea (Cleve), the south coast of Arabia (present record), the Red Sea (Giesbrecht), the Gulf of Suez (Gurney), the mouth of the Congo River (Rosendorn), the east coast of North America, Narragansett Bay (Williams), Woods Hole region (Wilson), the North Atlantic Ocean (Cleve), south-west of Ireland (Thompson), the English Channel, the coasts of Holland, north of Jutland and off the west coast of Sweden (Cleve) and the Mediterranean Sea (Giesbrecht, Steuer, Pesta, Rose).

As I have previously (Sewell, 1933) pointed out, this species is tolerant of brackish water conditions.

Oithona oculata Farran.

Oithona oculata, Farran, 1913, p. 188, pl. xxx, figs. 8, 9, pl. xxxi, figs. 2–9; Rosendorn, 1917, p. 37, text-fig. 23, *a–g*; Kiefer, 1929, p. 10.

Occurrence.—" Investigator " Sta. 614, Nankauri Harbour, Nicobar Islands, surface, 1 male.

Descriptive Notes.—♂. In its general form this example agrees closely with the description given by Rosendorn. The proportional length of the segments of the abdomen are as follows:

Abd. 1.	Abd. 2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
23	18	17	16	14	12 = 100

The furcal rami are twice as long as broad.

The 1st antenna closely resembles that of the male of *Oithona rigida* Giesbrecht. It is extremely difficult to make out the total number of segments, but there appear to be 13 in all, of which the 2nd and 3rd and the 4th to 6th respectively form overlapping groups. The 9th and 10th segments each bear a serrated spine on the anterior margin; segment 10 also bears a single sensory filament. The knee-joint lies between segments 11 and 12. Segment 12 bears a sensory filament about the middle of its length, and segment 13 bears two unequal sensory filaments, one slender and the other very stout at its distal end.

In the maxilliped the 2nd and 3rd segments each bear a single stout S-shaped spine, that is fringed with fine needle-like spinules.

In the swimming legs the terminal spines of the exopods are very long, exceeding in length the whole ramus.

The 5th leg bears two setæ distally.

DISTRIBUTION.—In the Pacific Ocean, Samoa (Rosendorn) and in the Indian Ocean, Christmas Island (Farran) and Nankauri Harbour, Nicobar Islands (present record).

Oithona plumifera Baird.

Oithona plumifera, Giesbrecht, 1892, p. 537, pl. iv, fig. 10, pl. xxxiv, figs. 12, 13, 22, 25, 27–29, 32, 33, pl. xliv, figs. 1, 7, 12–15; Rosendorn, 1917, p. 10, text-fig. 1, *a–d*; Kiefer, 1929, p. 4.

OCCURRENCE:

Sta. 61, surface, Northern area of Arabian Sea, numerous examples.

Sta. 96, Central area of Arabian Sea, 10 m., 7 females, 1 male.

REMARKS.—♀. Total length 1·12–1·20 mm. The proportional lengths of the thoracic and abdominal regions of the body are as 57 to 43. The proportional lengths of the segments of the posterior region are as follows:

Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
12	31	16	17	14	10 = 100

The segments of the 1st antenna are fringed with small spinules, as figured by Giesbrecht (1892, pl. xxxiv, fig. 33).

In some of the specimens the plumose setæ arising from the swimming legs are present, but in others they were either present only on the anterior two pairs of legs or were apparently absent altogether. Farran (1913, p. 183) has already pointed out that in some examples these setæ are not present, or at least were not visible, on the posterior limbs, and he suggests that they may have been broken off, but in several examples that I examined most carefully the posterior setæ tapered to a very delicate point, and showed no sign of being broken and equally no sign of any feathering. It seems probable that the plumose termination is a variable character and may in some cases be wanting.

REMARKS.—Rosendorn (1917) considers that *Oithona spinirostris* Claus is synonymous with *O. plumifera* Baird; as, however, Claus clearly shows four setæ arising from the endopod of the mandibular palp, which is a character of *O. atlantica* Farran, whereas *O. plumifera* only possesses three such setæ, I prefer to follow Sars, who regards Claus' *spinirostris* and Farran's *atlantica* as synonyms, the former name having priority. Kiefer (1929, p. 4) regards the form described by Sars (1913) in his 'Crustacea of Norway' as *O. spinirostris* as synonymous with *O. plumifera*.

Distribution.—This species has a very wide distribution, though, owing to the confusion that has arisen regarding the identity of this and other very closely related species, the exact limits cannot be determined. It appears probable that it occurs throughout the whole of the tropical and temperate regions of the three great oceans, and in the south has been able to get into and survive in the West Wind Drift; in the north it probably does not extend beyond the British Isles.

Oithona rigida Giesbrecht.

Oithona rigida, Giesbrecht, 1897, p. 324, pl. v, figs. 10–15; Cleve, 1901, p. 45, pl. v, figs. 7–18; Wolfenden, 1906, p. 1023, pl. xcix, fig. 42; Rosendorn, 1917, p. 39; Kiefer, 1929, p. 10.

Occurrence.—Sta. 61, Northern area of Arabian Sea, surface, 1 female.

Descriptive Notes.—Total length 0·83 mm. The proportional lengths of the anterior and posterior regions of the body are as 55 to 45. The cephalothorax is broadly oval, being widest about the posterior margin of the cephalon. The anterior margin is truncate when viewed from above, but seen from the side is produced downwards and forwards in a short, bluntly-rounded prominence. The proportional lengths of the segments of the posterior region are as follows:

Segment	Th. 4.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	12	29	16	16	13	14 = 100

The furcal rami are 2·33 times as long as broad. The outer seta is delicate and is shorter than the ramus; it arises slightly on the proximal side of the middle of the ramus; the 2nd furcal seta is the longest, and is equal in length to abdominal segments 3–5 plus the furcal ramus.

The 1st antenna reaches back to the posterior margin of the 2nd thoracic segment; it consists of 14 segments, having the following proportional lengths:

Segment 1.	2.	3–4.	5.	6.	7.	8.	9.	10.	11.	12.	13–14
9	7	12 (8–4)	6	12	10	13	5	12	3	6	5 = 100 (3–2)

Segments 3 and 4 and 13 and 14 respectively are almost completely fused, and 5 and 6 are partially fused. There is a short spinous prominence on the distal margin of the 5th segment (the 4th segment if segments 3 and 4 are counted as one).

The mouth parts are as figured by Cleve (1901).

In the swimming legs the terminal spine of the 3rd segment of the exopod is very considerably shorter than the ramus itself and, except in the 1st leg, it is shorter than the 3rd segment of the exopod, as is shown below—

	Total length of exopod.	Length of exopod 3.	Length of spine.
P. 1	25	11	14
P. 2	36	20	16
P. 3	39	22	19
P. 4	32	20	19

In the 1st foot the exopod bears 1, 1, 3 outer spines and 1, 1, 4 inner setæ; the endopod bears 1, 1, 5 inner setæ and 0, 0, 1 outer setæ. Farran (1913, p. 189) states that there are only 1, 1, 4 inner setæ on the endopod in *Oithona oculata*. Rosendorn (1917, p. 39) gives the number of inner setæ on the 3rd segment of the exopod as 1, 1, 5; this is incorrect.

In the 2nd and 3rd legs the exopod bears 1, 1, 3 outer spines and 1, 1, 5 inner setæ; the endopod bears 1, 2, 5 inner setæ and 0, 0, 1 outer setæ.

The 4th leg bears on the exopod 1, 1, 2 outer spines and 1, 1, 5 inner setæ; and the endopod bears 1, 2, 4 inner setæ and 0, 0, 1 outer setæ.

DISTRIBUTION.—This species appears to be widely distributed throughout the northern region of the Indian Ocean. It has been recorded from the Malay Archipelago (Cleve, A. Scott), Nankauri Harbour, Nicobar Islands (Sewell), the Ceylon Pearl Banks and Laccadive Sea (Thompson and A. Scott), the Maldive Archipelago (Wolfenden), the Arabian Sea (Thompson and A. Scott), the northern area of the Arabian Sea (present record), the Gulf of Aden (Cleve) and the Red Sea (Giesbrecht).

Oithona setigera (Dana).

Oithona setigera, Giesbrecht, 1892, p. 546, pl. xxxiv, figs. 3, 14, 15, 41; Rosendorn, 1917, p. 20, text-fig. 10, *a–c*; Kiefer, 1929, p. 6.
Oithona pelagica, Farran, 1908, p. 501.
Oithona tropica, Wolfenden, 1906, p. 1023, pl. xcix, figs. 44–48.

OCCURRENCE.—" Investigator," Sta. 614, Nankauri Harbour, surface, several examples.

REMARKS.—Wolfenden (*loc. cit.*) claims that his *Oithona tropica* differs from *O. setigera* in the absence of the club-shaped bristles on the 2nd basals of the 2nd pair of swimming legs, and in the different proportions of the thorax and abdomen and the relative lengths of the segments of the latter. The presence of a club-shaped seta on the 2nd leg does not appear to be a reliable character: Rosendorn has stated that in some instances the outer setæ of the other swimming legs are also club-shaped, and in the form described by Farran under the name *O. pelagica* this club-shaped seta was not present even on the 2nd leg.

DISTRIBUTION.—In the western part of the Pacific Ocean (Dana, Giesbrecht), east Pacific region (Giesbrecht), the Sandwich Islands, New Holland, New Guinea (?) (Brady), New Zealand (Farran), the Australian Barrier Reefs (Farran), Nankauri Harbour, Nicobar Islands (Sewell), the Maldive Archipelago (Wolfenden), the Red Sea and the Gulf of Suez (Rosendorn), the Gulf of Guinea (T. Scott), the coast of Ireland (Farran), the Mediterranean Sea (Thompson and A. Scott, Steuer, Pesta) and the Bay of Biscay (Farran).

Genus *Lubbockia* Claus.

Lubbockia aculeata Giesbrecht.

Lubbockia aculeata, Giesbrecht, 1892, p. 606, pl. xlviii, figs. 3, 9, 11, 13, 16, 20.

Occurrence.—" Investigator " Sta. 614, Nankauri Harbour, Nicobar Islands, surface, 1 female.

Descriptive Notes.—♀. Total length 2·22 mm. The proportional lengths of the anterior and posterior regions of the body are as 53 to 47. The proportional lengths of the segments of the posterior region are as follows :

Segment	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	13	26	16	16	16	13 = 100.

The anterior third of the genital segment is swollen and globular, and behind this the transverse diameter is sharply constricted.

Distribution.—In the tropical region of the Pacific Ocean, eastern area (Giesbrecht), off the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott) ; in the Indian Ocean in Nankauri Harbour, Nicobar Islands (present record) and the Red Sea (Cleve).

Section PŒCILOSTOMA.

Family Oncæidæ.

Genus *Oncæa* Philippi.

Oncæa clevei Früchtl.

Oncæa clevei, Früchtl, 1923, p. 455, pl. xxvi, figs. 19–22 ; *idem*, 1924, p. 89, figs. 62–70.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, several examples.

Descriptive Notes.—♀. Total length 0·68 mm. The proportional lengths of the anterior and posterior regions of the body are as 63 to 37. The proportional lengths of the segments of the posterior region are as follows :

Segment	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	9	48	10	8	10	15 = 100

The posterior segments of the abdomen are provided with a stout chitinous covering. The furcal rami are two and a half times as long as broad. The dorsal projection on the 2nd thoracic segment varies considerably in its development.

Remarks.—A few specimens are infected with a parasitic Peridinian, that appears to be *Blastodinium mangini* Chatton (1920).

Distribution.—This species has now been recorded from the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve), the Aru Archipelago (Früchtl) and the Arabian Sea (present record).

Oncæa conifera Giesbrecht.

Oncæa conifera, Giesbrecht, 1892, p. 591, pl. ii, fig. 10, pl. xlvii, figs. 4, 16, 21, 28, 34, 42, 55, 56; Esterly, 1906, p. 216, fig. 55, *a*, *b*; Farran, 1936, p. 127, text-figs. 25, *a–f*, 26, *a–c*.

Occurrence:

Sta. 56, South coast of Arabia, surface, 1 female.
Sta. 61, Northern area of Arabian Sea, surface, 1 female.
" Investigator," Sta. 614, Nankauri Harbour, Nicobar Islands, surface, 1 female.

Descriptive Notes.—♀. Total length 1·18 mm. The proportional lengths of the anterior and posterior regions of the body are as 64 to 36. The proportional lengths of the posterior region of the body are as follows:

Segment	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	16	42	8	6	14	14 = 100

The length and breadth of the furcal rami are as 2·5 to 1. These specimens agree with type (*a*) of Farran (1936).

In the present specimens and another that I examined from the Nicobar Islands the distal seta on the 2nd segment of the basipodite of the maxilliped is longer and stouter than the proximal one, and the end-claw is fringed with somewhat stout teeth instead of needle-like spinules; in the 4th swimming leg the proximal spine on the outer margin of the 3rd segment of the endopod is simple and not serrate, and is more delicate than the distal spine; and in the 5th leg the longer of the two setæ is stouter than the shorter one. In all these characters these examples agree with the descriptions of specimens from the Atlantic Ocean, and differ from Giesbrecht's account of the specimens from the Antarctic Ocean.

Remarks.—Included under the term "*conifera*" we have either a species that is extremely plastic, or more probably a number of separate races. The name was originally applied by Giesbrecht (1892) to a form taken in the western Pacific Ocean and off Naples in the Mediterranean Sea; in a subsequent paper he (1902) included under the same name a form that was taken by the " Belgica " in the Antarctic, and in this paper he notes that three " varieties " of the species can be recognized, namely, a warm-water Pacific-Mediterranean form, an Arctic form and an Antarctic form. The Arctic form was later separated off as a distinct species by Sars (1913–18, p. 191) with the name *O. borealis*. Sars also pointed out that the form which Cleve had recorded from the Malay Archipelago under the name *conifera* was in reality a very different species; this Malayan form was fully described by Früchtl (1923, p. 455, pl. xxvi, figs. 19–22; and 1924, p. 89, figs. 62–70), and was named *O. clevei*. Farran (1929, p. 285) has recorded the occurrence of both the typical Pacific-Mediterranean form and the Antarctic form in the " Terra Nova " collections, the Antarctic form occurring only to the south of lat. 60° S. In 1936, however, he records no less than three different forms of this species from the Australian Barrier Reef.

In the following table I have given the main characteristic features of the various forms, but there are further slight differences between the Antarctic form and the Pacific-Mediterranean form. In the former the distal claw-like segment of the maxilliped is armed, according to Giesbrecht's figure (1902, pl. xiii, fig. 9), with delicate needle-like spinules, whereas in the Pacific-Mediterranean form it is armed with coarser teeth; again in the third segment of the endopod of the 4th swimming leg of the Pacific-Mediterranean form the proximal spine on the outer margin is considerably more delicate than the distal spine, whereas in the Antarctic form Giesbrecht (1902, pl. xiii, fig. 10) figures the two spines as approximately of the same thickness; finally, in the same segment the distal external marginal spine arises in the Pacific-Mediterranean form much nearer the distal end of the segment than in the Antarctic form (*cf.* Giesbrecht, 1892, pl. xlvii, fig. 38, and Farran, 1936, fig. 26, with Giesbrecht, 1902, pl. xiii, fig. 10).

	Mediterranean form.	Australian Barrier Reef.			Antarctic form.
		Form A.	Form B. f. *furcula.*	Form C.	
Total length, ♀ .	1·15–1·23 mm.	1·15–1·20 mm.	1·08–1·14 mm.	0·96–1·02 mm.	1·10–1·25 mm.
Greatest width of cephalothorax	. .	$3\frac{1}{4}$ times in total length	$3\frac{2}{3}$ times in total length	$3\frac{1}{2}$ times in total length	. .
Dorsal projection of Th. 2	Well marked	Well marked	Slight	Slight	Well marked
Lateral extensions of Th. 4.	. .	Parallel sided	Inclining outwards	Parallel sided	. .
Length of abdomen and Th. 5	$1\frac{4}{5}$ times in the anterior region	$1\frac{3}{4}$ times in the anterior region	$1\frac{2}{3}$ times in the anterior region	$1\frac{2}{3}$ times in the anterior region	$1\frac{4}{5}$ times in the anterior region
Genital segment	Swollen anteriorly and tapered posteriorly	Slightly swollen anteriorly and tapered posteriorly to $\frac{1}{2}$ the anterior width	Slender	Stout and very slightly tapered	Slightly swollen anteriorly and very slightly tapered
	Longer than the rest of the abdomen by the length of the furcal ramus	Ditto	Longer than the rest of the abdomen by the length of the furca and anal segment	Longer than the rest of the abdomen by the length of the furca and $\frac{2}{3}$ the anal segment	As long as the rest of the abdomen
Anal segment .	Equal to preceding 2 segments	Ditto	Only slightly longer than either of the preceding 2 segments	Equal to $\frac{3}{4}$ of the preceding 2 segments	. .
Furcal rami . .	Equal to anal segment	Ditto	Ditto	Ditto	$1\frac{1}{3}$ as long as the anal segment
	Parallel sided	Parallel sided	Oval, rather than parallel sided	Parallel sided	Parallel sided
	2–$2\frac{1}{2}$ times as long as broad	Twice as long as broad	. .	. .	4 times as long as broad
4th swimming leg:					
(*a*) Conical process at distal end	Rounded; reaches to $\frac{2}{5}$ along the end-spine	Broadly rounded; reaches to $\frac{1}{2}$ way along the end-spine	Narrowly rounded; reaches to $\frac{1}{2}$ way along the end-spine	Pointed; reaches to $\frac{1}{2}$ way along the end-spine	Rounded; reaches to $\frac{1}{6}$ way along the end-spine
(*b*) Terminal spine	$4\frac{3}{4}$ times in the length of exopod 3	$3\frac{5}{8}$ times in the length of exopod 3	7 times in the length of exopod 3	$4\frac{1}{2}$ times in the length of exopod 3	$3\frac{1}{2}$ times in the length of exopod 3
5th foot . .	3 times as long as broad	. .	. .	. .	Scarcely longer than broad

Distribution.—Owing to the confusion that has existed in the past regarding the real determination of this species, it is not possible to be certain of its distribution, but it is probable that it occurs in the Pacific Ocean off the Californian coast (Esterly) and between lat. 13° N.–3° S., long. 87°–132° W. (Giesbrecht), off New Zealand and on the Australian Barrier Reefs (Farran) and from the Malay Archipelago (A. Scott). In the Indian Ocean from the Nicobar Islands (Sewell), the Arabian Sea (Thompson and A. Scott, present record), the Red Sea (Cleve, A. Scott) and the east coast of Africa (Thompson); in the Atlantic Ocean (Cleve, Wolfenden), the east coast of North America, Woods Hole (Wilson), and in the St. Lawrence River (Herdman, Thompson and A. Scott), in the English Channel (Norman and T. Scott, Farran), and in the Mediterranean Sea (Giesbrecht, Steuer, Pesta). If the form recorded by Giesbrecht (1902) from the "Belgica" collections is correctly referred to this species, it is also to be found in the Antarctic Ocean (Giesbrecht, Farran). In the Arctic region it is replaced by *O. borealis* Sars.

Oncæa media Giesbrecht.

Oncæa media, Giesbrecht, 1892, p. 591, pl. ii, fig. 12, pl. xlvii, figs. 1, 11, 29–33, 40; van Breemen, 1908, p. 187, fig. 200.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, several examples.

Descriptive Notes.—The females of this species appear to fall into two definite size-groups, which I term f. *major* and f. *minor* respectively.

Giesbrecht himself (1892, p. 593) has called attention to the great range in length of individuals of this species, namely, from 0·55 mm. to 0·82 mm., and remarks that the small examples were very rare. In the present collection the small specimens are considerably more rare than those of larger size, but I have failed altogether to discover any intermediate examples that would link the two forms together, the two groups being quite distinct without any overlapping.

forma *major*.

♀. Total length ranging from 0·733 mm. to 0·817 mm., with a mean of 0·7745 mm. Giesbrecht (*loc. cit.*, p. 593) gives the length as ranging from 0·55 to 0·82 mm. The proportional lengths of the anterior and posterior regions of the body are as 63 to 37. The proportional lengths of the segments of the posterior region are as follows:

Segment.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	11	53	8	6	8	14 = 100

The furcal rami are one and three-fourths times the length of the anal segment and are about two and a half times as long as broad. The anal segment and the furcal rami are in most examples covered with stout chitin, which in some instances is stained a rich orange-red colour.

In the 1st antenna the various segments have the following proportional lengths:

Segment	1.	2.	3.	4.	5.	6.
	14	24	37	10	5	10 = 100

Giesbrecht gives the lengths in his examples as 5, 10, 15, 4, 1, 4, which, when calculated as parts per 100, gives 13, 26, 38, 10, 3, 10.

In the maxilliped the two spines arising from the 2nd basal segment are subequal and are of moderate length, as in *O. venusta*.

The swimming legs are as figured. In the 4th leg the terminal spine arising from the endopod appears to be distinctly longer than is figured by Giesbrecht, the spine being as much as two-thirds the length of the segment, whereas Giesbrecht figures it as only about half that length.

forma *minor*.

♀. The total length ranges from 0·58 mm. to 0·65 mm., with an average length of

0·612 mm. The proportional lengths of the various segments of the posterior region of the body are as follows :

Segment.	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
	11	51	8	6	9	15 = 100

In this form the furcal rami appear to be somewhat more slender than in f. *major*, and are nearly three times as long as broad.

The proportional lengths of the segments of the 1st antenna are as follows :

Segment 1.	2.	3.	4.	5.	6.
14	25	37	10	4	10 = 100

The mouth parts appear to be exactly similar to those of f. *major*.

I have been unable to detect any differences in the legs from those of f. *major*.

♂. The total length ranges from 0·533 mm. to 0·683 mm. This is a considerably greater range than that given by Giesbrecht (1892, p. 599), who states that his examples measured from 0·6 to 0·63 mm. The present examples, while too few to give a definite picture, appear to indicate the possibility that there are two groups, corresponding to the two female groups ; the majority of the specimens form a compact group, in which the length ranges from 0·533 mm. to 0·617 mm., with an average length of 0·574 mm., but six other examples appear to suggest a second group, in which the length ranges from 0·633 mm. to 0·683 mm., with an average length of 0·658 mm.

Remarks.—Several specimens, belonging to both f. *major* and f. *minor*, are infected with a parasitic Peridinian that appears to resemble *Blastodinium mangini* Chatton (1920, p. 161).

Distribution.—In the east Pacific Ocean between lat. 5° and 10° N., long. 99° to 115° W. (Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran), in the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean off the Nicobar Islands (Sewell), on the Ceylon Pearl Banks (Thompson and A. Scott), in the Bay of Bengal (T. Scott), in the Laccadive Sea (Thompson and A. Scott), in the Maldive and Laccadive Archipelagos (Wolfenden), the Arabian Sea (Thompson and A. Scott, present records), the Red Sea (T. Scott, Thompson and A. Scott), off the east coast of Africa (T. Scott). In the Antarctic as far south as Ross Island, " if no mistake has occurred " (Farran). In the Atlantic Ocean in the Brazilian current (Farran), the tropical Atlantic (Farran, T. Scott, Wolfenden), the North Temperate Atlantic (Thompson and A. Scott, T. Scott, Cleve), the Bay of Biscay (Farran), in the Mediterranean Sea (Giesbrecht, Thompson and A. Scott, Steuer, Pesta, Gurney) and round the British Isles (Norman and T. Scott, Pearson).

Oncæa mediterranea Claus.

Oncæa mediterranea, Giesbrecht, 1892, p. 591, pl. iv, figs. 4, 16, pl. xlvii, figs. 8–10, 47 ; van Breemen, 1902, p. 187, fig. 199.

Occurrence.—" Investigator " Sta. 614, Nankauri Harbour, surface, a few examples.

Distribution.—Tropical region of the East Pacific (Giesbrecht), off New Zealand and on the Great Barrier Reef (Farran), the Malay Archipelago (Cleve). In the Indian Ocean it has been taken in Nankauri Harbour, Nicobar Islands (present record), the Bay of Bengal (T. Scott), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott), the Gulf of Aden and the Red Sea (Thompson and A. Scott), the Arabian Sea (Cleve, Thompson and A. Scott), off the east coast of Africa (T. Scott), round Cape Colony (Cleve). In the Atlantic Ocean it has been recorded from the South Atlantic (Wolfenden), the tropical Atlantic (Wolfenden, Farran), the North Atlantic (Wolfenden, Rose), the Mediterranean Sea (Claus, Thompson and A. Scott, Cleve, Früchtl, Pesta, Steuer) and off the British Isles (Pearson).

Oncœa venusta Philippi.

Onceæ venusta, Giesbrecht, 1892, p. 602, pl. ii, fig. 5, pl. iii, fig. 7, pl. xlvii, figs. 2, 5, 13, 17, 39, 44, 50, 54, 58.
Oncœa venusta, var. *venella*, Farran, 1929, p. 284, fig. 33.

Occurrence :

Sta. 61 A, Northern area of Arabian Sea, 2000–0 m., 19 females, 3 males.
Sta. 61 C, Northern area of Arabian Sea, surface, numerous examples of both sexes.
Sta. 96, Central area of Arabian Sea, 10 m., 2 females.
Sta. 145 D, Maldive area, 50–0 m. vertical, 1 female, 13 males.

Descriptive Notes.—Farran (1929, p. 284, fig. 33) has called attention to the existence of two forms of this species, differing in the main in size. The smaller form he has termed *venella*. Both forms are present at Sta. 61.

forma *typica*.

♀. Total length 1·185–1·250 mm. The proportional lengths of the anterior and posterior regions of the body are as 59 to 41, and the length and breadth of the anterior region are as 59 to 29. The proportional lengths of the segments of the posterior region are given below :

Segment	Th. 5.	Abd. 1–2.	Abd. 3.	Abd. 4.	Abd. 5.	Furca.
f. *typica*	13	46	7	7	9	18 = 100
f. *venella*	13	43	7	8	9	20 = 100

The furcal rami are four times as long as broad.

forma *venella* Farran.

♀. Total length 0·85 to 0·91 mm. This is slightly smaller than the examples from New Zealand, which, according to Farran, measure 0·92 to 1·07 mm., but agrees with the specimens from the Australian Barrier Reef, which measured 0·84 to 0·91 mm. Farran (1936) states that in the collections from the Great Barrier Reefs there was no clear cut separation either of form or size, but in the present specimens there is a clear gap in the length measurements of the two groups. The proportional lengths of the anterior and posterior regions of the body are as 60 to 40, and the length and breadth of the anterior region are as 60 to 24. The proportional lengths of the segments of the posterior region are given above and differ slightly from those of f. *typica*, the genital segment being slightly shorter and the furcal rami slightly longer. The proportions of the furcal rami are as 23 to 6.

Remarks.—It seems possible that these two forms have a slightly different breeding season, for in f. *typica*, out of a total of 84 specimens examined, 12, or 14 per cent., were ovigerous, and 5 others were bearing spermatophores; whereas in f. *venella*, examples of which were less common, out of a total of 23 specimens, only 1, or 4·4 per cent., was ovigerous and 1 other bore spermatophores. Examples of both the f. *typica* and f. *venella* were found to be infected with a parasitic Peridinian, apparently *Blastodinium mangini* Chatton (1920).

DISTRIBUTION.—f. *typica*: The western half of the Pacific Ocean, between lat. 20° N. and 4° S. (Giesbrecht) and between lat. 30° N. and 45° S. (Brady), off New Holland, New Guinea and the Philippine Islands (Brady), the Sulu Sea (Dana), New Zealand and the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A Scott), the Aru Archipelago (Früchtl). In the Indian Ocean from the Nicobar Islands (Sewell), the Bay of Bengal (Thompson), the Madras coast (Menon), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott), the Maldive region (Wolfenden, present record), the Arabian Sea (Thompson and A. Scott, present records), the Red Sea (Thompson, A. Scott, Thompson and A. Scott), the south-west region of the Indian Ocean (Thompson, Wolfenden), the Agulhas Current (Cleve), off Cape Colony (Cleve). In the Atlantic Ocean in the south temporate region (Farran, Wolfenden), in the Brazilian Current (Farran), the tropical Atlantic, the Gulf of Guinea (T. Scott, as *O. obtusa*), the north temperate Atlantic (van Breemen, Farran), off the Irish coast (Pearson), the east coast of North America, Woods Hole region and Chesapeake Bay (Wilson, Wheeler), in the St. Lawrence River (Herdman, Thompson and A. Scott), the Mediterranean Sea (Giesbrecht, Thompson, Thompson and A. Scott, Pesta, Rose).

f. *venella*: Off New Zealand and the Australian Barrier Reefs (Farran), the Arabian Sea (present record), the south temperate, tropical and north temperate regions of the Atlantic (Farran) and in the English Channel (Norman and T. Scott). It appears possible that this form does not occur in the Mediterranean Sea.

Family SAPPHIRINIDÆ.

Genus *Sapphirina* Thompson.

I have already (1932) called attention to the cutaneous glands in certain genera of marine Copepoda and especially in *Metridia*, *Pleuromamma*, *Lucicutia*, *Heterorhabdus*, *Hemirhabdus* and *Disseta*, in all of which there are numerous glands both on the segments of the body and on the appendages. A number of species in the first four of these genera are known to be phosphorescent (*vide* Giesbrecht, 1895). A similar property has been claimed for a species of the genus *Sapphirina*, but Giesbrecht does not accept this, and is of the opinion that what was thought to be phosphorescence was, in fact, the irridescence which is such a characteristic feature of the species of this genus. Sars (1913–18, p. 195) has suggested that the so-called "eyes" of the Corycæidæ may be luminous organs, and in a subsequent work (1919–21, p. 113) he makes the same suggestion for these organs in the genus *Sapphirina*. Without venturing to express any opinion regarding the possible luminescence of species of the genus *Sapphirina*, I would call attention to the presence in this genus of numerous cutaneous glands, that open on both dorsal and ventral aspects of the body, and in Text-figs. 68, A–C, I have indicated the arrangement of these pores in three species.

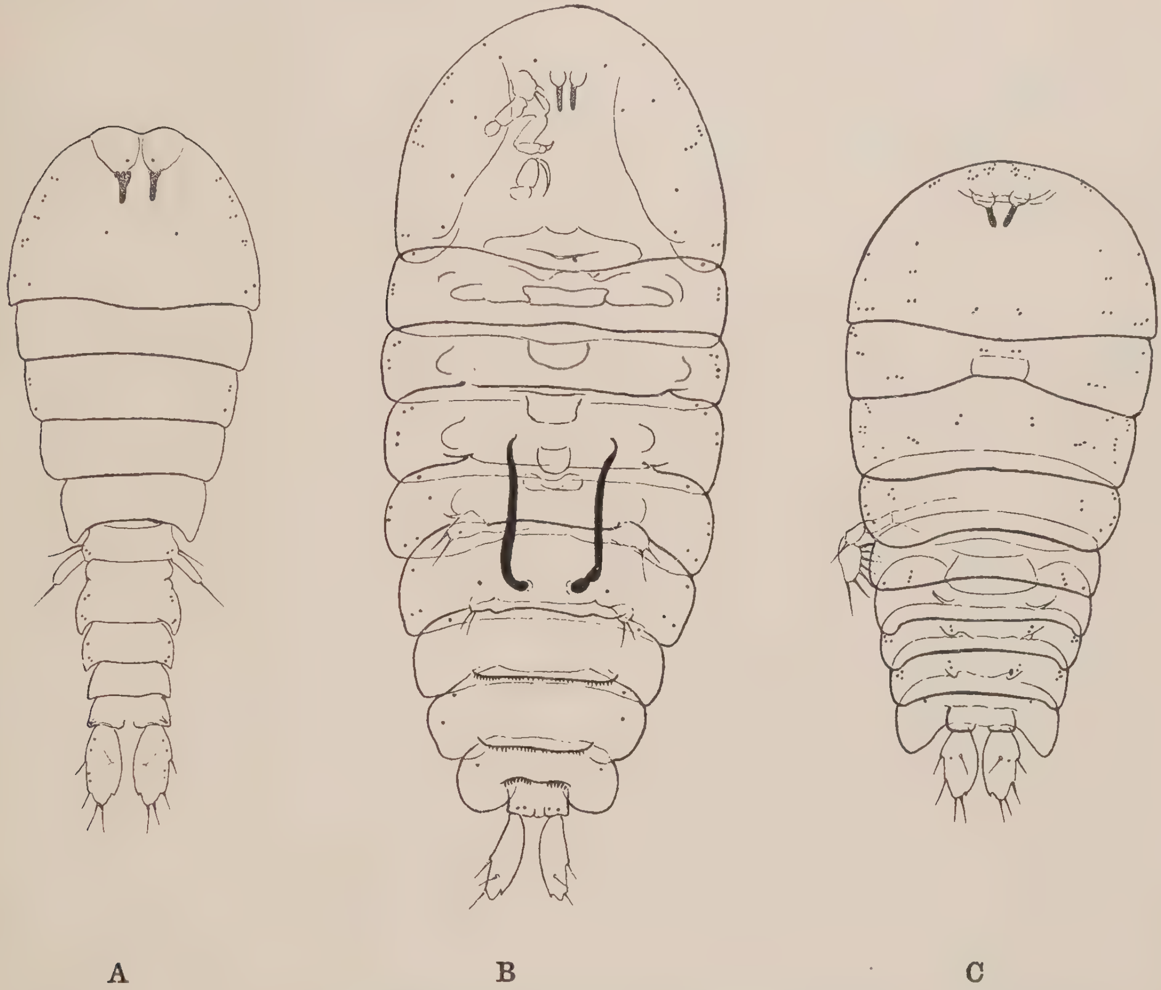
Sapphirina angusta Dana.

Sapphirina angusta, Giesbrecht, 1892, p. 620, pl. lii, figs. 5, 6, 20, 53, 55, 58, 66, pl. liii, figs. 6, 17, 29, 30, 55, pl. liv, figs. 2, 8, 17, 20, 60, 61; Lehnhofer, 1929, pp. 273, 315, figs. 1, 2, 47, 48.

OCCURRENCE:

Sta. 96, Central area of Arabian Sea, 10 m., 1 female, 2 males; 645–400 m., 2 males.

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 18 specimens; 1500–0 m., 15 males.



TEXT-FIG. 68.—A, *Sapphirina ovatolanceolata* Dana, *gemma* Dana, ♀: dorsal aspect. B, *Sapphirina iris* Dana, ♂, ventral aspect with the appendages removed. C, *Sapphirina nigromaculata* Claus, ♂, dorsal aspect.

DISTRIBUTION.—In the Pacific Ocean from the Californian coast (Esterly), the central Pacific region (Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean from the southern area, lat. 43° S., long. 78° E. (Dana), the Arabian Sea (Cleve, present records), the south-west area, lat. 35° S., long 45° E. (Brady), and to the south of the Cape of Good Hope (Dana). In the Atlantic Ocean to the west of South Africa (Cleve), in the south temperate region (T. Scott) and off the east coast of the Argentine (Brady, as *S. opaca*), in the tropical region

(Wolfenden, T. Scott), the Gulf of Guinea (T. Scott, as *S. opaca*), the north temperate region (Lubbock, as *S. opaca*, Rose), in the Gulf Stream to the south of Nantucket (Wilson), and in the Mediterranean Sea (Haeckel, Giesbrecht, Steuer, Pesta, Rose).

Sapphirina bicuspidata Giesbrecht.

Sapphirina bicuspidata, Giesbrecht, 1892, p. 620, pl. lii, figs. 39–41, pl. liii, figs. 9, 37, 54, pl. liv, figs. 5, 30, 66 ; Lehnhofer, 1929, pp. 274, 317, figs. 3, 47, 49.

Occurrence :

" Investigator " Sta. 614, Nankauri Harbour, Nicobar Islands, surface.
Sta. 61 C, Northern area of Arabian Sea, surface, 1 female.

Distribution.—In the Pacific Ocean in the eastern tropical area (Giesbrecht), the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean off the Nicobar Islands (present record), the Laccadive Sea (Thompson and A. Scott), the Arabian Sea (present record) and the Red Sea (Steuer). In the Atlantic Ocean in the tropical region (Farran), and in the Mediterranean Sea (Giesbrecht, Steuer).

Sapphirina iris Dana.

Sapphirina iris, Sars, 1921, p. 114, pls. lxxv, lxxvi ; Lehnhofer, 1929, pp. 279, 323, figs. 9, 55.
Sapphirina salpæ, Giesbrecht, 1892, p. 618, pl. ii, fig. 9, pl. lii, figs. 1, 2, 18, 19, 27, 45, 49, pl. liii, figs. 7, 23, 24, 60, pl. liv, figs. 9, 13, 19, 57.
Sapphirina longifurca, A. Scott, 1909, p. 259, pl. lxix, figs. 15–20.

Occurrence :

" Investigator " Sta. 632, Car Nicobar, Nicobar Islands, surface.
Sta. 42, South coast of Arabia, surface, 2 females, 1 male.
Sta. South coast of Arabia, surface, 31 females, 6 males.
Sta. 56, South coast of Arabia, surface, 1 male.

Remarks.—All these examples were of the " *longifurca* " type and were associated with examples of the aggregated form of the Salp *Pegea confœderata* ; a number of these Salps were collected and preserved in formalin solution, and subsequent examination of the bottle produced no less than 37 specimens, some free in the preserving solution, others still contained within the Salp.

Distribution.—In the east Pacific region (Giesbrecht), the coast of California (Esterly), the west coast of South America (Dana), the Philippine Islands and New Holland (Brady), off New Zealand (Brady, Farran), the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean from the Nicobar Islands (present record), the Bay of Bengal (Thompson), the Ceylon Pearl Banks (Thompson and A. Scott), south-west of Ceylon (Thompson), the Arabian Sea (Thompson and A. Scott, present records) and the Red Sea (?) (Steuer). In the Atlantic Ocean from the south temperate region (Brady, T. Scott), the tropical region (T. Scott), the north temperate region (Brady, Wolfenden, Rose), the Mediterranean Sea (Claus, Giesbrecht, Rose), and possibly, on occasion, the Norwegian coast (Sars).

Sapphirina metallina Dana.

Sapphirina metallina, Giesbrecht, 1892, p. 620, pl. liv, figs. 47–56 ; Lehnhofer, 1929, pp. 284, 325, figs. 16–18, 57, 58.

Occurrence.—" Investigator " Sta. 614, Nankauri Harbour, Nicobar Islands, surface.

Distribution.—In the Pacific Ocean in lat. 1° N., long. 173° E. (Dana), lat. 18° N., long. 117° E. (Brady), to the south of New Guinea (Brady), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean in the Nicobar Islands (present record), the Maldive Archipelago (Wolfenden), the Arabian Sea (Thompson and A. Scott), the Red Sea (Steuer). In the Atlantic Ocean in the tropical region (Brady, Wolfenden), the Gulf of Guinea (Lubbock, T. Scott), the north temperate region off the Canary Islands (Thompson) and in the Mediterranean Sea (Giesbrecht, Steuer, Pesta, Rose). Wolfenden (1911) has recorded this species from the Antarctic Ocean.

Sapphirina nigromaculata Claus.

Sapphirina nigromaculata, Giesbrecht, 1892, p. 619, pl. lii, figs. 32, 35, 43, pl. liii, figs. 13, 26, 36, 48, pl. liv, figs. 6, 37, 40, 68; Lehnhofer, 1929, pp. 304, 336, figs. 38–41, 65, 66.

Occurrence :

"Investigator" Sta. 614, Nankauri Harbour, Nicobar Islands, surface.
Sta. 61 C, Northern area of Arabian Sea, surface, 5 females, 3 males.
Sta. 96, Central part of Arabian Sea, 10 m., 1 female, 2 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 1 female, 1 male.

Distribution.—In the tropical Pacific Ocean (Giesbrecht), and perhaps from the Philippine Islands (Brady, as *S. inæqualis*), the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean from the Nicobar Islands (present record), the Bay of Bengal (Thompson), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott), the Maldive area (Thompson and A. Scott, Wolfenden), the Arabian Sea (Cleve, Thompson and A. Scott, Pesta, present records), the Red Sea (Giesbrecht, Cleve), the east coast of South Africa off Port Shepstone (Cleve) and the south-west region of the Indian Ocean (Thompson). In the Atlantic Ocean from the tropical region (Cleve, Farran, Wolfenden) and off Rio de Janeiro in the Brazilian Current (Farran), the north temperate region (Rose), off the Canary Islands (Thompson, as *S. inæqualis*), off the east coast of North America, south of Martha's Vineyard (Wilson) and in the Mediterranean Sea (Claus, Haeckel, Cleve, Steuer, Pesta, Rose).

Sapphirina opalina Dana—*darwini* Haeckel.

Sapphirina opalina, Giesbrecht, 1892, p. 620, pl. lii, figs. 44, 46, 52, 54, pl. liii, figs. 4, 22, 34, 56, pl. liv, figs. 3, 32, 33, 64.
Sapphirina opalina-darwinii, Lehnhofer, 1929, pp. 295, 330, figs. 29–32, 61, 62.

Occurrence :

"Investigator" Sta. 614, Nankauri Harbour, Nicobar Islands, surface.
"Investigator" Sta. 670, lat. 5° 56′ N., long. 76° 22′ E., surface.
Sta. 96, Central area of Arabian Sea, 645–400 m., 22 females, 13 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 5 males; 1500–0 m., 4 males.
Sta. 145 D, Maldive area, 50–0 m., vertical, 1 female.

Distribution.—In the Pacific Ocean from the Gulf of Panama and the west Pacific region (Giesbrecht), off the Philippine Islands (Brady), off New Zealand and from the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott). In the Indian Ocean from the Nicobar Islands (present records), the Laccadive Sea (present record), the Maldive area (Wolfenden, present record), the Arabian Sea (Cleve, present record), the Red Sea (Steuer) and to the east of South Africa (Cleve). In the Atlantic Ocean from the Gulf of Guinea (T. Scott), the tropical region (Lubbock, Dana, Cleve, Wolfenden, T. Scott), off Rio de Janeiro in the Brazilian Current (Farran), the Carribean Sea (Cleve), off the Azores (Rose) and in the Mediterranean Sea (Claus, Haeckel, Thompson, Steuer, Pesta).

Sapphirina ovatolanceolata Dana—*gemma* Dana.

Sapphirina ovatolanceolata, Giesbrecht, 1892, p. 620, pl. i, figs. 7, 8, pl. lii, figs. 21, 25, 26, 47, 56, 65, 67, pl. liii, figs, 2, 18, 20, 25, 28, 58, pl. liv, figs. 1, 18, 42, 45.

Sapphirina gemma, Giesbrecht, 1892, p. 620, pl. lii, figs. 22, 62, 64, pl. liii, figs. 19, 31, 32, 61, pl. liv, figs. 10, 12.

Sapphirina ovatolanceolata-gemma, Lehnhofer, 1929, pp. 298, 333, figs. 33–37, 63, 64.

Occurrence :

Sta. 61 A, Northern area of Arabian Sea, surface, 7 females ; 1000–0 m., 1 male.
Sta. 61 C, Northern area of Arabian Sea, surface, 2 females.
Sta. 96, Central area of Arabian Sea, 10 m., 2 females ; 645–400 m., 1 male.
Sta. 131 D, Southern area of Arabian Sea, vertical, 500–0 m., 6 specimens ; 1500–0 m., 3 males.

Remarks.—The total length of the males ranged from 3·283 to 3·583 mm. and of the females from 2·40 to 2·767 mm.

These examples belong to the *ovato-lanceolata* form.

Distribution.—In the Pacific Ocean from the eastern region (Giesbrecht, Dana), off New Zealand (Dana, Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (A. Scott). In the Indian Ocean from the south-east temperate region (Lehnhofer), the Bay of Bengal (Lehnhofer), the Ceylon Pearl Banks (Thompson and A. Scott), the Arabian Sea (Cleve, Thompson and A. Scott, present records) and from the region to the south of the Cape of Good Hope (Dana), the Red Sea (Cleve, Thompson and A. Scott). In the Atlantic Ocean in the West Wind Drift (Lehnhofer), in the Benguela Current (Cleve, Wolfenden, Lehnhofer), the Gulf of Guinea (Lubbock), in the tropical region (Lubbock, Giesbrecht, Cleve, Wolfenden, T. Scott), in the Brazilian Current (T. Scott), the north temperate region (Farran), the east coast of North America to the south of Martha's Vineyard (Wilson), in Chesapeake Bay (Wilson), the Gulf Stream south of Nantucket (Wheeler) and in the Mediterranean Sea (Thompson, Giesbrecht, Steuer, Pesta, Rose).

Sapphirina sinuicauda Brady.

Sapphirina sinuicauda, Giesbrecht 1892, p. 620, pl. lii, fig. 31, pl. liii, figs. 42, 50, pl. liv, figs. 26, 36, 70.

Sapphirina auronitens-sinuicauda, Lehnhofer, 1929, pp. 289, 329, figs. 22–28, 50, 60.

Occurrence :

"Investigator" Sta. 670, lat. 5° 56′ N., long, 76° 22′ E., surface.
Sta. 61 C, northern area of Arabian Sea, surface, 1 female, 1 male.

Distribution.—In the Pacific Ocean from the east area and central region of the tropical belt (Giesbrecht), from the Philippine Islands (Brady) and the Malay Archipelago (A. Scott). In the Indian Ocean from the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (present record), the Arabian Sea (present record), the Red Sea

(Steuer), and the east coast of Natal (Cleve). In the Atlantic Ocean from the west of South Africa (Cleve), the Gulf of Guinea (T. Scott), off the Azores (Cleve, Rose) and in the neighbourhood of the American coast (Rose) and in the Mediterranean Sea (Lehnhofer, Rose).

Sapphirina stellata Giesbrecht.

Sapphirina stellata, Giesbrecht, 1892, p. 620, pl. lii, figs. 7–9, pl. liii, figs. 15, 35, 59, pl. liv, figs. 22, 27, 69; Lehnhofer, 1929, pp. 286, 327, figs. 19, 20, 52, 59.

OCCURRENCE:

"Investigator" Sta. 614, Nankauri Harbour, Nicobar Islands, surface.
"Investigator" St. 670, Indian Ocean, lat. 5° 56′ N., long. 76° 22′ E., surface.
Sta. 61 A, Northern area of Arabian Sea, surface, 2 females.
Sta. 61 C, Northern area of Arabian Sea, surface, 1 female.

DISTRIBUTION.—In the east Pacific region in the tropical belt (Giesbrecht), at several stations in the western region (Brady), off the Australian Barrier Reefs (Farran) and in the Malay Archipelago (Carl, A. Scott). In the Indian Ocean in the south-east region off the Abrolhos Islands (Giesbrecht), off the Nicobar Islands (present records), the Arabian Sea (Cleve, Lehnhofer), the Persian Gulf (Pesta) and in the south-west region (Thompson). In the Atlantic Ocean from the neighbourhood of the American Coast (Rose). Under the name *S. ovalis* this species was recorded by Brady from the tropical Atlantic Ocean, as well as from the central and western parts of the Pacific Ocean, and by T. Scott from the Gulf of Guinea and the tropical Atlantic, but the occurrence of the species in the Mediterranean Sea, as recorded by Thompson (1888) under the name *S. ovalis*, appears to be open to doubt.

Genus *Copilia* Dana.

Copilia hendorffi Dahl.

Copilia hendorffi, Lehnhofer, 1926, pp. 129, 138, text-fig. 8, 1–8, text-fig. 15, 1–7.

OCCURRENCE.—Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 1 male.

DISTRIBUTION.—In the Pacific Ocean off New Zealand (Farran). In the Indian Ocean in the southern area (Lehnhofer), the Arabian Sea (present record), and in the contra-equatorial current (?) (Lehnhofer); off Cape Colony and in the south-east part of the Atlantic Ocean (Lehnhofer).

Copilia lata Giesbrecht.

Copilia lata, Giesbrecht, 1892, p. 648, pl. l, fig. 40; Lehnhofer, 1926, pp. 132, 141, text-fig. 11, 1–4, text-fig. 17, 1–6.
Copilia elliptica, ♂, Giesbrecht, 1892, p. 648, pl. l, figs. 3, 35.

OCCURRENCE.—Sta. 96, Central area of Arabian Sea, 10 m., 10 females; 645–400 m., 2 females, 1 male.

DISTRIBUTION.—In the Pacific Ocean in both east and west areas of the tropical zone (Giesbrecht), off the Australian Barrier Reefs (Farran). In the Indian Ocean in the south equatorial and contra-equatorial currents (Lehnhofer), the Arabian Sea (present records). In the Atlantic Ocean in the south temperate region and the Brazilian current (Giesbrecht), in the tropical region (Wolfenden, Lehnhofer, Farran), in the Guinea current (Lehnhofer), and in the north temperate region (Dahl).

Copilia mediterranea (Claus).

Copilia denticulata, ♂, Giesbrecht, 1892, p. 647, pl. i, fig. 2, pl. l, figs. 2, 27, 28, 38, 43.
Copilia oblonga, ♀, Giesbrecht, 1892, p. 648, pl. l, fig. 31.
Copilia mediterranea, Lehnhofer, ♂, p. 127, text-fig. 6, 1–4; ♀, p. 137, text-fig. 14, 1–4.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1500–0 m., 6 males.
Sta. 61 C, Northern area of Arabian Sea, 1000–0 m., 6 males; 1500–0 m., 8 males.
Sta. 76, Gulf of Oman, 200–0 m., 2 males.
Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., vertical, 1 male.
Sta. 145 C, Maldive area, 300–0 m., vertical, 3 males.
Sta. 145 D, Maldive area, 500–0 m., vertical, 2 males.

DISTRIBUTION.—From both east and west Pacific region (Giesbrecht). In the Indian Ocean from Nankauri Harbour, Nicobar Islands (Sewell), the Bay of Bengal (T. Scott), the Arabian Sea and the Gulf of Oman (present records). In the Atlantic Ocean from the south temperate region (Wolfenden), (?) the Gulf of Guinea (T. Scott), the tropical Atlantic (Wolfenden, Lehnhofer), the north temperate Atlantic (Dahl, T. Scott, Lehnhofer) and the Mediterranean Sea (Pesta, Steuer, Früchtl, Rose). Lehnhofer has suggested that in the tropical region this species descends into deep water to avoid the heat of the surface water, and this seems to be borne out by the depths at which the majority of specimens were taken during the John Murray Expedition.

Copilia mirabilis Dana.

Copilia mirabilis, Giesbrecht, 1892, p. 647, pl. l, figs. 5, 7, 19, 34, 37, 42; Lehnhofer, 1926, pp. 125, 135, 143, text-fig. 4, 1–4, text-fig. 13, 1–5.
Copilia mirabilis, var. *platyonyx*, Lehnhofer, 1926, p. 127, text-fig. 4, 5–7, text-fig. 18.

f. *typica* Dana.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 3 males; 1500–0 m., 5 males.
Sta. 61 C, Northern area of Arabian Sea, surface, 2 females, 2 males; 1000–0 m., 23 males; 1500–0 m., 38 males.
Sta. 76, Gulf of Oman, 200–0 m., 41 males; 600–0 m., 14 males.
Sta. 96, Central part of Arabian Sea, 10 m., 19 females, 4 males; 645–400 m., 8 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 1 female, 81 males; 1500–0 m., vertical, 43 males.
Sta. 145 C, Maldive area, 50–0 m., vertical, 2 males; 300–0 m., 1 female, 6 males; 500–0 m., 1 male.
Sta. 145 D, Maldive area, 100–0 m., vertical, 13 males; 500–0 m., 1 female, 5 males.
Sta. 172, Central part of Arabian Sea, 400–0 m., 1 female, 2 males; 850–0 m., 12 males.

f. *platyonyx* Lehnhofer.

OCCURRENCE :

Sta. 61 C, Northern area of Arabian Sea, 1500–0 m., 2 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 1 male.
Sta. 145 C, Maldive area, 300–0 m., vertical, 1 male.
Sta. 145 D, Maldive area, 50–0 m., vertical, 1 male ; 100–0 m., 4 males ; 300–0 m., 1 male ; 500–0 m., 2 males.

DISTRIBUTION.—Throughout the tropical region of the Pacific Ocean in both east (Giesbrecht) and west (Dana, Giesbrecht), off the Gilbert Islands (Dana), off Fiji, Papua, Kei Islands and the Philippine Islands (Brady), off New Guinea and Java (Dahl), the Australian Barrier Reefs (Farran), the Japanese Sea (Marukawa) and the Malay Archipelago (Cleve, A, Scott). In the Indian Ocean from the Nicobar Islands (Sewell), the tropical region of the ocean (Lehnhofer, Wolfenden), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott), the Maldive area (Wolfenden, present records), the Arabian Sea (Giesbrecht, Thompson and A. Scott, present records), the Gulf of Oman (present records), the Red Sea (A. Scott, Thompson and A. Scott) and east of Cape Colony (Cleve). In the Atlantic Ocean in the south temperate region (Brady, Wolfenden), the tropical region (Lubbock, Brady, Wolfenden), the Gulf of Guinea (T. Scott), the north temperate region (Thompson), the east coast of North America, Nantucket (Wilson) and the Mediterranean Sea (T. Scott). Lehnhofer also doubtfully records a single specimen from the West Wind Drift in lat. 56° 30′ S. ; long. 14° 29′ E.

The variety *platyonyx* has now been recorded from the Australian Barrier Reefs (Farran) ; the Maldive area and the Arabian Sea (present records), the Indian contra-equatorial current, off the east coast of Africa, the south equatorial current to the south-west of Sumatra ; and in the south equatorial current and the Guinea current in the Atlantic Ocean (*vide* Lehnhofer).

Copilia quadrata Dana.

Copilia quadrata, Giesbrecht, 1892, p. 647, pl. l, figs. 1, 10, 13, 16, 22, 28, 33, 36, 41 ; Lehnhofer, 1926, pp. 130, 140, text-fig. 10, 1–4, text-fig. 16, 1–5.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, 1000–0 m., 1 male.
Sta. 61 C, Northern area of Arabian Sea, 1000–0 m., 8 males ; 1500–0 m., 2 males.
Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 1 female, 1 male.

DISTRIBUTION.—In the Pacific Ocean both east and west in the tropical region (Dana, Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean in Nankauri Harbour, Nicobar Islands (Sewell), the tropical region (Lehnhofer), the Arabian Sea (present records), the south-west region of the Indian Ocean (Wolfenden), and off Cape Colony (Lehnhofer, T. Scott). In the Atlantic Ocean in the south temperate region (Wolfenden), in the tropical region (Wolfenden), the Gulf of Guinea (T. Scott), the North Atlantic (Farran) and the Mediterranean Sea (Steuer, Pesta, Rose).

Copilia vitrea (Haeckel).

Copilia vitrea, Giesbrecht, 1892, p. 647, pl. l, figs. 6, 12, 17, 18, 23–26, 30, 39, 44, 46, 47 ; Lehnhofer, 1926.

OCCURRENCE :

Sta. 61 C, Northern area of Arabian Sea, 1000–0 m., 2 males.

Sta. 131 D, Southern area of Arabian Sea, 500–0 m., vertical, 8 males ; 1500–0 m., 2 males.

DISTRIBUTION.—In the west Pacific Ocean (Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran) and the Malay Archipelago (A. Scott). In the Indian Ocean in the south equatorial and contra-equatorial currents (Lehnhofer), the Arabian Sea (present records). In the tropical region of the Atlantic Ocean (Dahl, Giesbrecht, Wolfenden), in the Gulf of Guinea (T. Scott, Lehnhofer), in the north temperate region (Dahl, Lehnhofer) and in the Mediterranean Sea (Giesbrecht, Thompson).

Family LICHOMOLGIDÆ.

Genus *Pachysoma* Claus.

Pachysoma tuberosum Giesbrecht.

Pachysoma tuberosum, Giesbrecht, 1892, p. 615, pl. xlviii, fig. 37.

OCCURRENCE.—" Investigator " Sta. 614, Nankauri Harbour, Nicobar Islands, surface, 1 female.

DISTRIBUTION.—In the Pacific Ocean in the Gulf of Panama (Giesbrecht), and the Australian Barrier Reefs (Farran) ; in the Indian Ocean in Nankauri Harbour, Nicobar Islands (present record), to the south-east of Ceylon in lat. 3° 30′ S., long. 83° 30′ E. (Cleve), and on the east of Cape Colony in the Agulhas current (Cleve).

Genus *Corycæus* Dana.

Sub-genus *Corycæus* M. Dahl.

M. Dahl (1912, p. 12) includes in this sub-genus *Corycæus speciosus* Dana, *C. crassiusculus* Dana and *C. vitreus* Dana. This last species was only known from the male until Farran (1936, p. 134) recorded what he believes to be the female from New Zealand and the Australian Barrier Reefs. The correct determination of the females of these three species is one of extreme difficulty, since almost the only features that have been used for their separation are the proportional lengths of the abdominal segments, and especially of the anal segment.

Corycæus (*Corycæus*) *crassiusculus* Dana. (Text-fig. 69, A–H.)

Corycæus elongatus, Claus, 1863, p. 157, pl. xxiv, figs. 3, 4 (*non C. elongatus*, Giesbrecht).
Corycæus danæ, Giesbrecht, 1892, p. 660, pl. li, figs. 59, 60.
Corycæus (*Corycæus*) *crassiusculus*, M. Dahl, 1912, p. 21, pl. iii, figs. 1–7.

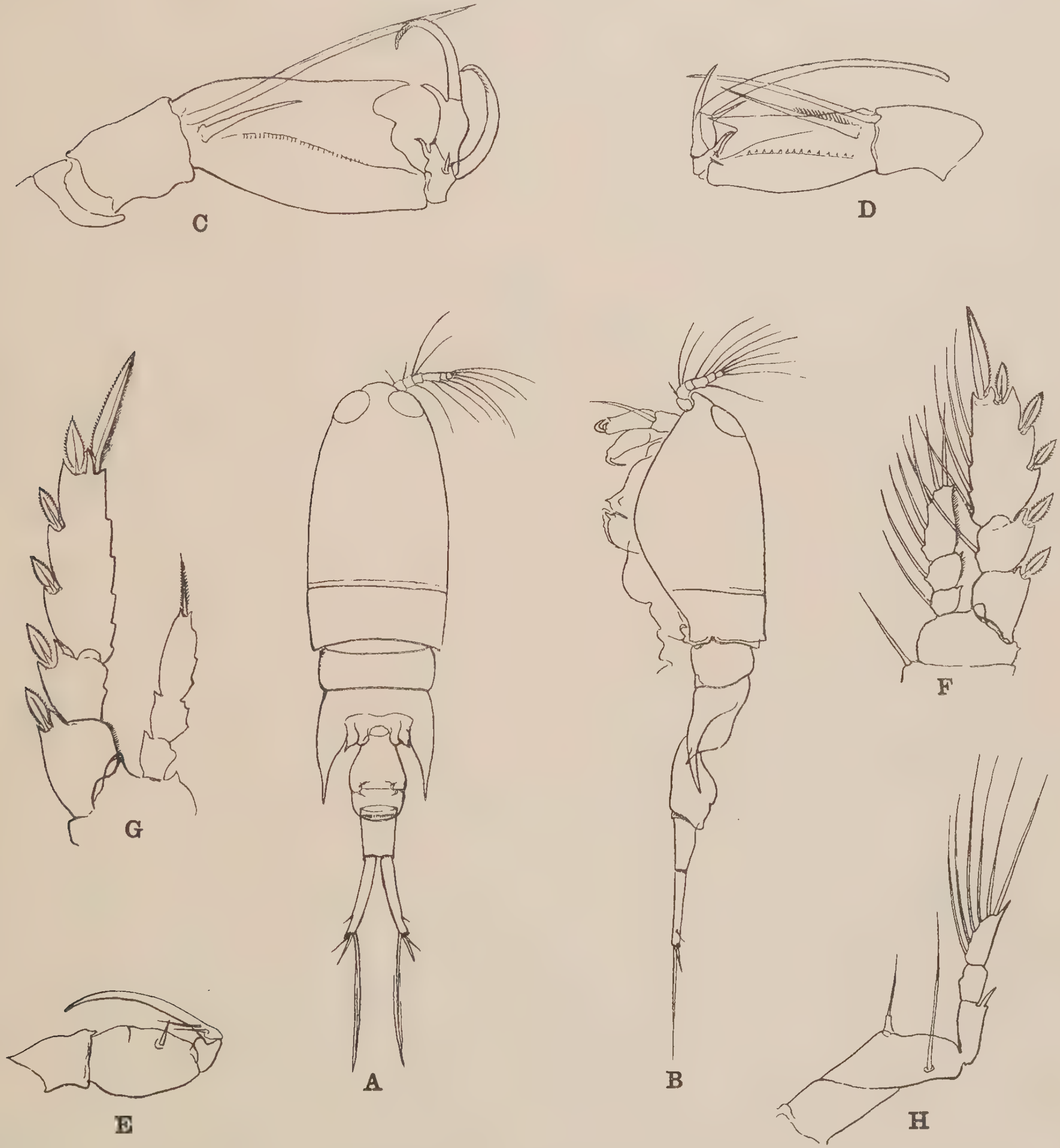
OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, surface, 12 females, 3 males.

Sta. 61 C, Northern area of Arabian Sea, surface, 8 females.

Descriptive Notes.—♀. The total length ranges from 1·60 to 1·717 mm., with a mean length of 1·647 mm. The proportional lengths of the anterior and posterior regions of the body are as 62 to 38. The proportional lengths of the various segments of the body are as follows :

	Cephalon & Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
(I)	466	52	73	16	166	93	134 = 1000
(II)	467	60	80	15	161	80	136 = 1000
(III)	472	50	80	16	156	90	136 = 1000
(IV)	483	63	70	26	149	74	135 = 1000



Text-fig. 69.—*Corycæus* (*Corycæus*) *crassiusculus*, A, Dana. Dorsal view, ♀. B, Lateral view, ♀. C, 2nd antenna, ♀. D, 2nd antenna, ♂. E, 2nd maxilla, ♂. F, 1st leg, ♀. G, 2nd leg, ♀. H, 4th leg, ♀.

The cephalon (Text-fig. 69, A, B,) and 1st thoracic segment are demarcated by a line that can be traced running across the dorsum and down to the lateral margin; the proportional lengths of the two parts are as 362 to 105 or 376 to 107. The genital segment is more pyriform than oval, as stated by M. Dahl, and overreaches the anal segment dorsally; it is armed with a row of minute spinules along the ventral part of the posterior margin. The anal segment tapers slightly, and the margins of the articulations of the furcal rami are fringed with small spinules. The furcal rami taper slightly towards the posterior end, and the distal margin is produced in a comb of small triangular spinules. The proportional lengths of the abdominal segments and the furcal rami in the present examples exhibit some degree of variation, as shown above, and the proportional dimensions of the anal segment also vary, the ratio of length to breadth at the base ranging from 1·39 to 1 to 1·27 to 1.

The proportional lengths of the six segments of the 1st antenna are as follows:

Segment 1.	2.	3.	4.	5.	6.
21	15	16	24	14	10 = 100

The antennal setæ are long and slender.

The 2nd antenna (Text-fig. 69, C) agrees closely with the figure given by M. Dahl for this appendage in *C. clausi* (*cf.* M. Dahl, 1912, pl. ii, fig. 7).

As regards the swimming legs, M. Dahl states that the three anterior pairs in this species are larger in proportion to the body than in *C. speciosus* Dana. I have carefully measured the length of these limbs in both species, and the proportional lengths of the appendages in specimens *of the same size* would be as follows:

	crassiusculus.	*speciosus.*
P. 1 . .	31·2 .	30·0
P. 2 . .	42·7 .	41·0
P. 3 . .	39·2 .	40·0

The difference is thus so slight as to be negligible.

♂. Total length, 1·367 to 1·483 mm. The proportional lengths of the various segments of the body are as follows:

Cephalon & Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
466	46	79	23	159	79	148 = 1000

The 5th thoracic segment bears laterally two delicate setæ, the shorter about half the length of the longer. The 1st abdominal segment is armed ventrally on its posterior margin with a row of minute spinules; the genital aperture is armed with a short spinous process on the inner side of the seta, as in *speciosus.* The 2nd abdominal segment is also armed with a row of spinules along the articular margin of the furcal rami. The distal end of the furcal ramus is produced externally in a serrated crest.

Remarks.—M. Dahl (1912, p. 23) maintains that "the nearly related *clausi* is the Atlantic representative of *C. crassiusculus.*" It seems to me, however, to be doubtful whether it is possible to differentiate between the females of these two, so-called species; Farran (1929, p. 292) states that the New Zealand specimens of what he then took to be *crassiusculus* were intermediate between *C. clausi* and *C. crassiusculus* as regards the shape of the abdomen, but in a later paper he (1936, p. 134) suggests that these females are specimens of *C. vitreus*, the female of which was previously unknown. The present examples of the female appear to form a stage in a series of forms that display a gradual change in the proportions of the abdominal segments and the furcal rami. In the following table I have given the dimensions in parts per 100 of the length of these segments, recalculated from measurements in those instances in which such have been given by the authors and, where no measurements are stated, from measurements of the figures that illustrate the account. In this series I have included Claus' description and figure of *Corycæus elongatus*. Claus (1863, p. 157, pl. xxiv, figs. 3, 4) in his original account states quite clearly that the abdomen possesses two segments, "Das Abdomen in beiden Geschlechtern deutlich zweigliedrig," and this is clearly shown in his figure. Giesbrecht (1892, p. 666) was in error in stating that *elongatus* only has one segment, and, as M. Dahl (1912) has pointed out, he has confused in his account of what he took to be *elongatus* two species belonging to the sub-genus *Agetes*, viz. *typicus* and *limbatus*. A comparison of the figure given by Claus (1863, pl. xxiv, fig. 3) and fig. 69B appears to me to show without doubt that *elongatus* Claus must be grouped with *clausi* and *crassiusculus*, in the sub-genus *Corycæus*.

	Abdominal segments.			
	Abd. 1.	Abd. 2.	Furca.	
clausi (Atlantic)	47·2	22·2	30·6	(From Farran.)
elongatus (Messina)	46·5	16·7	36·8	(,, Claus.)
vitreus (Australia)	46·2	21·5	32·5	(,, Farran.)
clausi (Atlantic)	45·5	22·7	31·8	(,, M. Dahl.)
crassiusculus (New Zealand)	43·4	25·3	31·5	(,, Farran.)
,, (Arabian Sea)	42·2	23·6	34·1	Present examples.
,, (,, ,,)	41·6	20·7	37·7	
,, (Australia)	40·5	24·3	35·2	(From Farran.)
,, (Indo-Pacific)	38·5	23·0	38·5	(,, M. Dahl.)

It seems to be impossible to draw any hard and fast line of differentiation between the two forms *clausi* and *crassiusculus*, and it is preferable to regard them as two forms of a single species, namely, an Indo-Pacific form and an Atlantic form.

Distribution.—Widespread throughout the Pacific and Indian Oceans. In the Pacific it has been recorded from the eastern and central tropical areas (Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran), in the Aru Archipelago (Früchtl) and from the Malay Archipelago (Cleve, A. Scott). In the Indian Ocean it has been taken off Christmas Island (Farran), in the Bay of Bengal (Thompson), off the Madras coast (Menon, as *venustus* Dana), on the Ceylon Pearl Banks and in the Laccadive Sea (Thompson and A. Scott), the Arabian Sea (present records), the Red Sea (Cleve, Thompson, A. Scott, and Thompson and A. Scott), off the East African coast (Thompson), in the Agulhas current and off South Africa (Cleve, Wolfenden). M. Dahl (1912) maintains that it does not occur in the Atlantic Ocean, yet several authors, who have apparently correctly recorded its occurrence in Indian waters, have recorded it from the western region also, namely, from the South Atlantic in lat. 26–32° S. (T. Scott, as *venustus* Dana), the Gulf of Guinea (T. Scott, as *venustus* Dana, the tropical Atlantic (Wolfenden), the North Atlantic (Cleve), the Woods Hole region (Wilson, as *danæ* Giesbrecht) and from the Mediterranean Sea (Thompson, Thompson and A. Scott, Rose or *elongatus* Claus).

Corycæus (*Corycæus*) *speciosus* Dana.

Corycæus speciosus, Giesbrecht, 1892, p. 673, pl. li, figs. 39, 40.
Corycæus (*Corycæus*) *speciosus*, M. Dahl, 1912, p.13, pl. i, figs. 1–13, pl. ii, figs. 1–4.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, surface, several examples.
Sta. 61 C, Northern area of Arabian Sea, surface, several specimens.

DESCRIPTIVE NOTES.—♀. The total length ranges from 1·75 to 1·98 mm., with a mean length of 1·903 mm. The proportional lengths of the various segments of the body are as follows :

Cephalon & Th. 1.	Th. 2.	$\underbrace{\text{Th. 3. Th. 4.}}$	Th. 5.	Abd. 1.	Abd. 2.	Furca.
430	62	78	25	147	76	182 = 1000.

In a few examples the line of demarcation between the cephalon and the 1st thoracic segment can be seen as a fine line running across the middle of the dorsum, dividing this region into two segments, that have the proportional lengths of 333 and 97.

The posterior border of the genital segment on the ventral side is fringed with a row of minute spinules. The posterior margin of the 2nd abdominal segment, where the furcal rami are articulated, is also armed with a row of spinules. The furcal rami vary somewhat in length ; the distal border is produced in a small crest that is fringed with a series of small triangular pointed prominences. Of the two unequal spines that are carried by the furcal rami the longer is serrated.

The segments of the 1st antenna have the following proportional lengths :

Segment 1.	2.	3.	4.	5.	6.
21	14	16	26	13	10 = 100

In the 2nd antenna there appears to be an additional chitinous scute, that is, comma-shaped, lying between the cephalon and what is usually regarded as the 1st basal segment of the appendage ; the 3rd (usually termed the 2nd) basal segment is the longest, and bears on its outer aspect a longitudinal row of minute spinules.

The mouth parts appear to be as figured by M. Dahl (*loc. cit.*, 1912).

M. Dahl (*loc. cit.*, p. 16) gives a setal formula for the swimming legs, but this is somewhat misleading, as she includes as " spines " or setæ the small projections on the distal outer margins of certain segments of the endopods. The actual setal formula is as follows, the Roman numerals indicating spines and the Arabic numerals setæ :

	P. 1.						P. 2.						P. 3.						P. 4.		
	Exopod.			Endopod.			Exopod.			Endopod.			Exopod.			Endopod.			Exopod.		
	i.	ii.	iii.	i.	ii.	iii.	i.	ii.	iii.	i.	ii.	iii.	i.	ii.	iii.	i.	ii.	iii.	i.	ii.	iii.
Outer margin .	I	I	III, I	..	..	..	I	I	III, I	..	..	..	I	I	III, I	..	..	..	I	0	I, I
Inner margin .	0	1	4	1	1	4, 1	0	1	5	1	2	3, I	0	1	5	1	2	2	0	1	5

In the 1st leg the 3rd segment of the endopod bears 4 setæ on its inner margin, and from the distal end a seta-like spine arises between two small spinous projections. In the 2nd leg there are 3 setæ arising from the inner margin, and a spine, serrated on its outer border, springs from the distal margin between two spinous projections. In the 4th leg the 3rd segment of the exopod bears a single marginal spine at the distal outer angle, and from the distal extremity springs a long, tapering and seta-like spine, while 5 setæ arise from the inner margin.

♂. The total length ranges from 1·583 to 1·733 mm., with a mean length of 1·633 mm. The proportional lengths of the various segments of the body are as follows :

Cephalon & Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
419	44	85	15	148	93	196 = 1000

As in the female, the posterior margin of the 1st abdominal segment is armed with a row of small spinules on its ventral aspect.

Distribution.—This species has a wide distribution throughout the tropical and temperate regions of all three great oceans. It has been recorded in the Pacific from the west coast of America between lat. 10° S. and 20° N. (Giesbrecht), off New Zealand and the Australian Barrier Reefs (Farran), in the Aru Archipelago (Früchtl) and in the Malay Archipelago (A. Scott). In the Indian Ocean it has now been taken off Christmas Island (Farran), in the Nicobar Islands (Sewell), the Bay of Bengal (Thompson), the Ceylon Pearl Banks (Thompson and A. Scott), the Laccadive Sea (Thompson and A. Scott), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Cleve, Thompson and A. Scott, present record), the Gulf of Aden and Red Sea (Cleve, Thompson and A. Scott), the east coast of Africa (Thompson), and in the Agulhas current off South Africa (Stebbing). It has also been recorded from the Suez Canal by Thompson and A. Scott, but Gurney (1927*a*, p. 161) regards this as improbable. In the Antarctic Ocean off Kaiser Wilhelm II Land (Wolfenden). In the Atlantic Ocean it is known from the Gulf of Guinea (T. Scott), the South Atlantic (Giesbrecht, T. Scott), in the Brazilian current (Cleve), in the tropical Atlantic (Dana, Brady, T. Scott, M. Dahl), in the North Atlantic (Thompson, T. Scott, M. Dahl, Rose, van Breemen), on the east coast of North America, Chesapeake Bay and Woods Hole region (Wilson), on the coast of Ireland (Pearson) and in the Mediterranean Sea (Giesbrecht, Thompson and A. Scott).

Sub-genus *Urocorycæus* M. Dahl.

Corycæus (*Urocorycæus*) *longistylis* Dana.

Corycæus longistylis, Giesbrecht, 1892, p. 674, pl. li, figs. 36, 37.
Corycæus (*Urocorycæus*) *longistylis*, M. Dahl, 1912, p. 42, pl. vi, figs. 6–13, pl. vii, figs. 1–3.

Occurrence :

Sta. 131 D, Southern area of Arabian Sea, 1500–0 m., 1 female, ovigerous.
"Investigator" Sta. 614, Nankauri Harbour, Nicobar Islands, 14 m.

Descriptive Notes.—In the specimens from the Nicobar Islands there is a quite distinct line of demarcation between the cephalon and the 1st thoracic segment, and the 2nd thoracic segment presented the appearance along the posterior border of a fringe of very fine needle-like spinules.

The proportional lengths of the abdominal segments and the furcal rami are as 48 to 52; M. Dahl (1912, p. 43) gives the proportions in her examples as 102 to 120–125, or approximately 45 to 55. The genital segment is fringed posteriorly with a row of short needle-like spinules. According to M. Dahl (1912, p. 43) there is, on the hinder margin of the anal segment above the furcal ramus, on each side a small tooth; in the Nicobar specimens the articular margins of the anal segment with furcal rami are armed with groups of spinules, usually four spines in a group.

DISTRIBUTION.—The species is widely distributed throughout the Indo-Pacific Oceans; it has been taken in the Western Pacific between lat. 37° S. and 30° N., off the Sandwich Islands (Hawaii), Fiji, New Guinea, the Australian coast, the Philippine Islands and the China Sea (Brady, as *varius*), between lat. 1°–5° N., long. 109°–115° W. (Giesbrecht), off New Zealand (Farran), the Australian Barrier Reefs (Farran), the Malay Archipelago (Cleve, A. Scott); in the Indian Ocean from Christmas Island (Farran), in the Nicobar Islands (present record), the Gulf of Manaar (Thompson and A. Scott), the Maldive and Laccadive Archipelagoes (Wolfenden), the Arabian Sea (Thompson and A. Scott, present record), the Gulf of Aden (Thompson and A. Scott), the Red Sea (T. Scott, Thompson and A. Scott) and the Gulf of Suez (Thompson and A. Scott). M. Dahl (1912) maintains that this species does not occur in the Atlantic Ocean, but this is open to doubt. The character of the 2nd antenna in the female is quite distinct, and the species has been recorded from the Gulf of Guinea (T. Scott, as *varius*), the tropical Atlantic between lat. 37° S. to 3° N. (Wolfenden), the North Atlantic between lat. 21° and 26° N. (T. Scott), and from the Mediterranean Sea in 35° N., 18° E. (T. Scott). While this last record is open to some doubt, since the collection was not made direct from the sea, but by straining the water from the ship's tanks, the position seems to be much too far to the west to be accounted for on the supposition that the specimens had been taken in the Red Sea and had lived in the tanks for a week, namely, from June 29th to July 4th.

Sub-genus *Ditrichocorycæus* M. Dahl.

As Gurney (1927, p. 161) has pointed out, the species of the genus *Corycæus* (*sensu lato*) are amongst the most difficult of all Copepods to discriminate; and this seems to me to be particularly the case with species of the sub-genus *Ditrichocorycæus*. M. Dahl (1912, p. 31) in her key to the species divides these into two groups according to the relative length of the furcal ramus and the two abdominal segments. In the first group she places those species in which the rami are short, *i.e.* not, or only slightly, longer than the anal segment and not two-thirds as long as the genital segment; in this group fall *asiaticus*, *andrewsi* and *subtilis*. In the second group M. Dahl places those species in which the furcal rami are about twice as long as the anal segment or at least two-thirds as long as, or longer, than the genital segment; to this group belong *amazonicus*, *anglicus*, *brehmi*, *africanus*, *dubius*, *erythræus*, *lubbocki*, *minimus* and *tenuis*. This latter group, so far as the females are concerned, can be subdivided into two smaller sub-groups by the presence or absence of a ventral hook on the anterior part of the genital segment; such a hook is present in *africanus*, *amazonicus*, *anglicus*, *brehmi*, *dubius* and *erythræus*, but is absent in *minimus* and *tenuis* and, in my opinion, in the true *lubbocki* also. As regards this last species Giesbrecht (1892, p. 671) does not mention the presence of any such hook, and in his figure (pl. li, fig. 57) he clearly indicates that it is absent. F. Dahl (1894, p. 71) in a footnote to his key remarks that it is not absolutely certain that the form which he identified as *lubbocki* is really Giesbrecht's species, since it possessed a ventral spine. M. Dahl (1912, p. 61), however, ignores this difference and, stating that in *lubbocki* there is a ventral hook that is small and slightly bent, concludes that the form described by Farran (1911, p. 291, pl. xii, figs. 8, 9) under the name *tenuis* Giesbrecht is the same species. With this opinion I entirely disagree. The true *lubbocki* Giesbrecht, in which the ventral hook is absent, has been redescribed by Früchtl (1924, p. 96) under the name *farrani*. That the forms "*tenuis*" Farran (*non* Giesbrecht) and "*lubbocki*" M. Dahl (*non* Giesbrecht) are synonyms, as suggested by M. Dahl, is, I think, probable, and it remains to be seen whether these can be referred to any other species; it seems to me probable that they are both synonyms of *africanus* F. Dahl (*vide infra*, p. 280).

Considerable confusion appears to have arisen regarding the species *erythræus* Cleve and *dubius* Farran. M. Dahl appears to regard both these as good species; Gurney (1927, p. 161), however, regards them as synonyms. As Farran (1911, p. 292) pointed out in his original description of *dubius*, there are certain differences between the two forms, and until further examples can be studied it seems best to regard them, as M. Dahl has done, as distinct. There seems little doubt that the form which Gurney obtained from the Suez Canal and identified as *erythræus* Cleve is identical with Farran's *dubius*, but is probably not the same as Cleve's *erythræus*. There is very little difference in the proportional lengths of the abdominal segments and the furcal ramus, as is clear from the following table, in which I have calculated these lengths in parts per 100 of the whole abdomen:

♀.	Abd. 1.	Abd. 2.	Furca.
erythræus Cleve	31·25 (1)	31·25 (1)	37·5 (1·2)
dubius Farran	29·17 (21)	31·94 (23)	38·89 (28)
"*erythræus*" Gurney	32·64 (110)	29·67 (100)	37·69 (127)
♂.			
erythræus Cleve	40·0 (12)	26·7 (8)	33·3 (10)
dubius Farran (Dahl)	40·3 (25)	24·2 (15)	35·5 (22)
"*erythræus*" Gurney	41·83 (174)	24·04 (100)	34·13 (142)

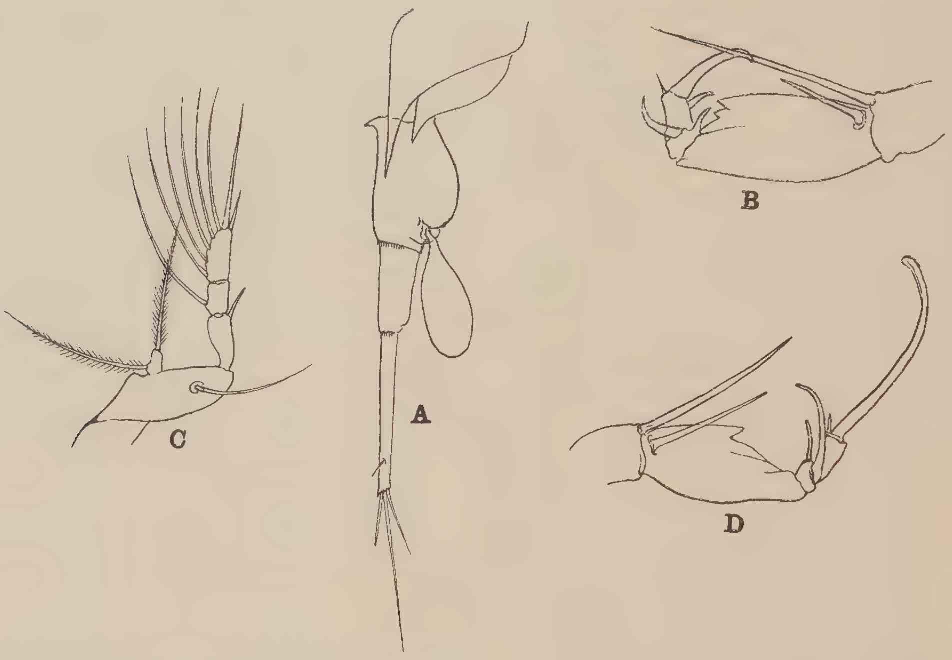
There are, however, appreciable differences in the 2nd antenna of the female; in *erythræus* Cleve the spine arising from the 3rd basal segment is about half the length of that from basal 2, and reaches the distal margin of the segment, whereas in *dubius* Farran and "*erythræus*" Gurney the 2nd basal spine is only about one-third the length of the 1st and reaches only half-way along the 3rd segment.

? *Corycæus (Ditrichocorycæus) africanus* F. Dahl. (Text-fig. 70, A–C.)

Corycæus (Ditrichocorycæus) africanus, M. Dahl, 1912, p. 62, pl. ix, figs. 8, 16, 24–29 and 32.
? *Corycæus (Ditrichocorycæus) lubbocki*, (pars) M. Dahl, 1912, p. 64, pl. x, figs. 20–28.
? *Corycæus tenuis*, Farran, 1911, p. 291, pl. xii, figs. 8, 9.

Occurrence.—“ Investigator ” Sta. 614, Nankauri Harbour, Nicobar Islands, surface, 1 female.

Descriptive Notes.—This single specimen agrees in many respects with the form that was described by Farran (*loc. cit.*) under the name *tenuis* Giesbrecht ; as Farran pointed out, if he followed F. Dahl’s key the form would be referred to *C. anglicus*, but differed from this species in several characters. M. Dahl (1912, p. 64) referred the form to *C. lubbocki* Giesbrecht, but I am convinced that she was wrong. Neither *C. tenuis* Giesbrecht nor the true *C. lubbocki* Giesbrecht possess a hook on the ventral aspect of the genital segment, whereas such a hook is present in *C. tenuis* Farran (*non* Giesbrecht), in *C. lubbocki* M. Dahl (*non* Giesbrecht), and in the present specimen that I have examined.



Text-fig. 70.—*Corycæus* (*Ditrichocorycæus*) *africanus* F. Dahl, ♀. a, Side view of last thoracic segment and abdomen. b, 2nd antenna. c, 4th leg. *Corycæus* (*Ditrichocorycæus*) *asiaticus* F. Dahl, ♂. d, 2nd antenna.

According to M. Dahl’s key (1912, p. 53) the choice appears to lie between *africanus* F. Dahl and *brehmi* Steuer. In the following table I have given the proportional lengths of the abdominal segments, calculated in parts per 100 of the total abdominal length in these different forms :

	Abd. 1.	Abd. 2.	Furca.	
tenuis Farran (*non* Giesbrecht)	35	20	45	(dorsal).
	30·8	25·6	43·6	(ventral).
lubbocki M. Dahl (*non* Giesbrecht)	35·2	22·5	42·3	(dorsal).
Present specimen	35·5	22·1	42·4	(dorsal).
africanus F. Dahl	37·5	18·75	43·75	(dorsal).
	30·0	22·9	47·1	(ventral).

There is thus but little difference between these forms.

In the present specimen the 2nd antenna agrees closely with the description and figures of *africanus* F. Dahl (*cf.* M. Dahl, 1912, pl. ix, fig. 29), except that Dahl shows the proximal claw as arising from the distal end of the 3rd basal segment, which is clearly an error. The 1st basal spine is about three times the length of the 2nd. The 3rd basal segment terminates in two triangular prominences.

In the 4th swimming leg the endopod bears two setæ on which the proximal arises almost at right angles from the endopod (*cf.* M. Dahl, 1912, pl. ix, fig. 16).

Distribution.—According to M. Dahl, *africanus* is limited to the Atlantic Ocean and is a coastal form from the west coast of Africa. If, however, I am correct in referring the present example to this species, the distribution must be extended to the Indian Ocean, Nankauri Harbour, Nicobar Islands, and if Farran's specimens are also examples of the species, it occurs off Christmas Island.

Corycæus (*Ditrichocorycæus*) *asiaticus* F. Dahl. (Text-fig. 70, d.)

Corycæus murrayi, Farran, 1911, p. 294, pl. xiii, figs. 1–6.
Corycæus (*Ditrichocorycæus*) *asiaticus*, M. Dahl, 1912, p. 74, pl. xi, figs. 1–9.

Occurrence.—Sta. 56, Southern area of Arabian coast, surface, 2 males.

Distribution.—This species appears to be confined to the Indo-Pacific region. It has been recorded from New Zealand (Kramer, as *auklandicus*), the Aru Archipelago (Früchtl), the Australian Barrier Reefs (Farran) and the Banda Straits (M. Dahl) in the Pacific; and in the Indian Ocean from near Sumatra in lat. 4° 56′ N., long 95° 16′ E., Christmas Island (Farran, as *murrayi*), the central area of the Indian Ocean in lat. 9° S., long. 65° E. (M. Dahl), the Arabian Sea (present record), the Suez Canal (Gurney) and off Zanzibar (M. Dahl).

Corycæus (*Ditrichocorycæus*) *lubbocki* Giesbrecht. (Text-fig. 71, a–f).

Corycæus lubbocki, Giesbrecht, 1892, p. 660, pl. li, figs. 57, 58.
? *Corycæus* (*Ditrichocorycæus*) *lubbocki*, M. Dahl, 1912, p. 64, pl. x, figs. 20–28.
Corycæus (*Ditrichocorycæus*) *farrani*, Früchtl, 1929, p. 96, figs. 72, 73.

Occurrence.—Sta. 56, Southern coast of Arabia, surface, 1 female.

Descriptive Notes.—♀. Total length 1·033 mm. The proportional lengths of the anterior and posterior regions of the body are as 56 to 44. Früchtl (*loc. cit.*) gives the length of the posterior region as 74·3 per cent. of the anterior region (or 57 to 43). The proportional lengths of the various segments are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3.	Th. 4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
364	69	33	47	59	18	153	62	195 = 1000

The cephalon and 1st thoracic segment are separate. The 3rd thoracic segment is produced in a long stout spinous process that extends to half the length of the genital segment. The 4th thoracic segment is produced backwards and ends in a sharp spine.

Früchtl (*loc. cit.*, p. 96) gives the lengths of the segments of the posterior region as 129, 74, 170; I have recalculated these measurements as parts per 100 of the total abdominal length and the result is 35, 20, 45; but a comparison of these measurements and his figure reveals certain differences, and if one takes the lengths of the several parts measured along the dorsal margin, the resulting proportional lengths come to 38, 16, 46 which agree very closely with the measurements observed by Giesbrecht and myself.

	Genital segment.	Anal segment.	Furcal ramus.	
Giesbrect	37	17	46	= 100
Früchtl	38	16	46	= 100
Present specimen	37	15	48	= 100

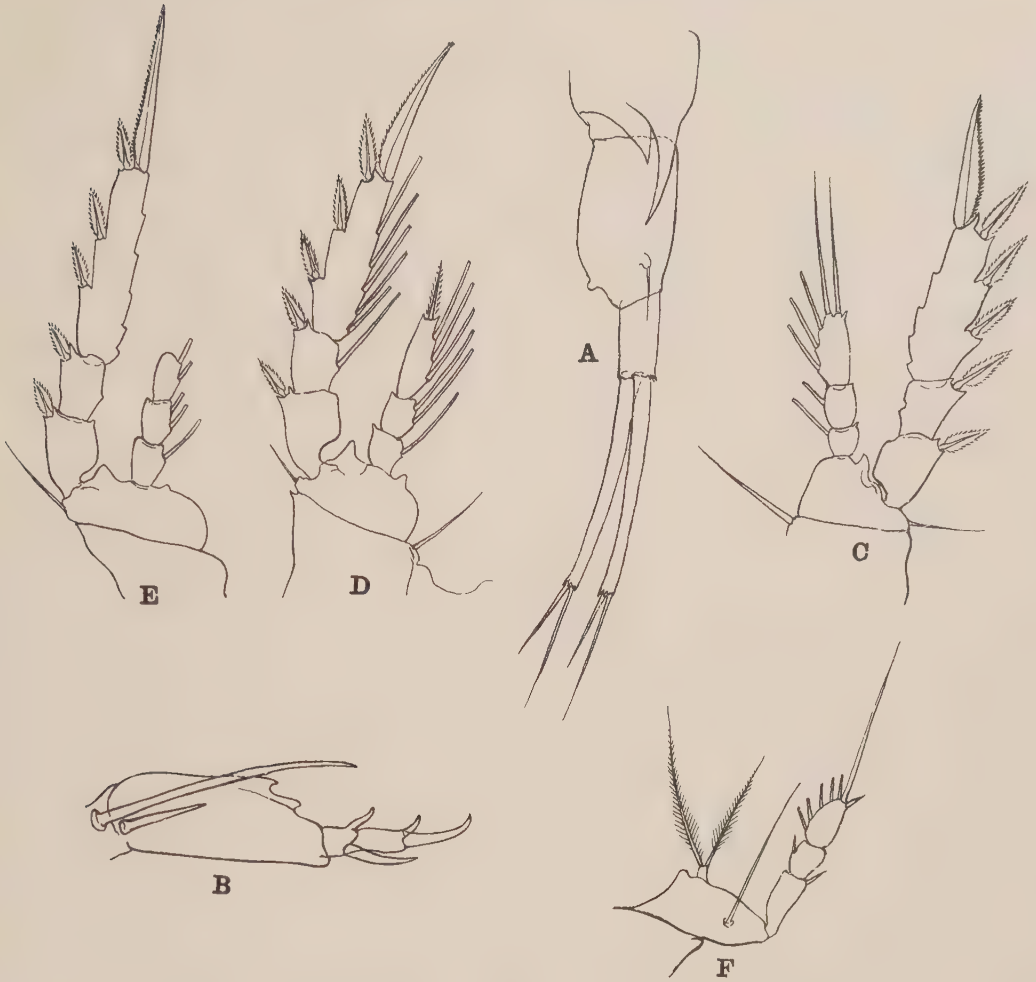
The genital segment (Text-fig. 71, A) is produced in a rounded eminence at the antero-ventral region, but I have been entirely unable to detect any spinous projection in this region, such as is described and figured by M. Dahl; in this respect this example agrees with the figures given by Giesbrecht (1892, pl. li, fig. 57) and Früchtl (1924, fig. 72). The small rounded prominence on the dorsal aspect between the genital openings is present. The long furcal rami have a slight upward bend, as figured by Früchtl (*loc. cit.*, fig. 72).

The swimming appendages exhibit the following proportional lengths in their various segments, and for convenience of reference I have given the lengths as calculated from the measurements given by Früchtl (*loc. cit.*, p. 97).

P. I	Exopod 1	17	..
	,, 2	13	..
	,, 3	38	38.5 (Früchtl).
	Endspine	32	31·5 (,,).
P. II	Exopod 1	18·5	..
	,, 2	12	..
	,, 3	38·5	37·8 (Früchtl).
	Endspine	31	31 (,,).
P. III	Exopod 1	18	..
	,, 2	12	..
	,, 3	37	37 (Früchtl).
	Endspine	33	33 (,,).
P. IV	Exopod 1	19	..
	,, 2	11	..
	,, 3	16	..
	Endspine	54	..

The endspine of the exopod of the 2nd leg is slightly curved inwards.

DISTRIBUTION.—Apparently confined to the Indo-Pacific region: off Hong Kong (Giesbrecht), the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl), the Ceylon Pearl Banks and Arabian Sea and Red Sea (Thompson and A. Scott), the Arabian Sea (present record) and the Red Sea (Cleve). As Gurney (1927, p. 161) has pointed out, the record of occurrence of this species in the Mediterranean Sea is probably an error, due to confusion of this species with *Corycæus* (*Ditrichocorycæus*) *brehmi* Steuer.



TEXT-FIG. 71.—*Corycæus* (*Ditrichocarycæus*) *lubbocki* Giesbrecht, ♀. A, Last thoracic segment and abdomen, lateral view. B, 2nd antenna. C, 1st leg. D, 2nd leg. E, 3rd leg. F, 4th leg.

Sub-genus *Onychocorycæus* M. Dahl.

In this sub-genus M. Dahl (1912, p. 82) includes the following species :

agilis Dana (= *gracillicaudatus* Giesbrecht).
giesbrechti F. Dahl (= *venustus* Esterly, *non* Giesbrecht).
latus Dana.
catus F. Dahl.
ovalis Claus.
pacificus F. Dahl.
pumilus M. Dahl.

And to these must be added *medius* Gurney (1927, p. 165, fig. 26), if this is a true species. Of these, *catus*, *pacificus* and *pumilus* are stated by M. Dahl to be Indo-Pacific forms, and closely related to these is *ovalis*, that she regards as a purely Mediterranean species. These four form a very closely related group that can be subdivided by the presence or absence of a ventral projection on the anterior part of the genital segment of the male, such a projection being present in *catus* and *pumilus* and absent in *pacificus* and *ovalis*.

Corycæus (*Onychocorycæus*) *agilis* Dana.

Corycæus (*Onychocorycæus*) *agilis*, M. Dahl, 1912, p. 84, pl. xii, figs. 10–20.
Corycæus gracilicaudatus, Giesbrecht, 1892, p. 660, pl. li, figs. 15, 30; Farran, 1911, p. 290, pl. xi, figs. 11, 12.

OCCURRENCE:

Sta. 56, South Arabian coast, surface, 10 females, 23 males.

Sta. 61 C, Northern area of Arabian Sea, surface, several examples of both sexes.

REMARKS.—These examples are slightly larger than those described by M. Dahl. The females average 1·00 mm. in total length, and the males 0·75 mm.

The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3–4.	Abd. 1.	Abd. 2.	Furca.
332	98	43	78	144	125	180 = 1000

The two furcal rami are in several instances of unequal length, the left being the longer in the proportion of 21 to 20. The genital segment is fringed along the ventral part of the posterior margin with minute spinules. The 2nd abdominal segment is also armed with small spinules along the ventral part of the articulation with the furcal rami.

DISTRIBUTION.—In the Pacific Ocean between lat. 5° N. and 3° S., long. 99°–115° W. (Giesbrecht), off New Guinea, New Pommerania, Pelee Islands and Luzon (M. Dahl), on the Australian Barrier Reefs (Farran), in the Aru Archipelago (Früchtl) and in the Malay Archipelago (A. Scott, as *gracilicaudatus*). In the Indian Ocean from Christmas Island (Farran), off Ceylon (M. Dahl, Thompson and A. Scott, as *gracilicaudatus*), Laccadive Sea (Thompson and A. Scott), Maldive and Laccadive Archipelagoes (Thompson and A. Scott, Wolfenden), the Arabian Sea (Cleve, Thompson and A. Scott, present records), the Gulf of Aden (A. Scott and off Madagascar (M. Dahl). It has been recorded as *gracilicaudatus* by Wolfenden from the tropical Atlantic.

Corycæus (*Onychocorycæus*) *catus* F. Dahl.

Corycæus catus, Farran, 1911, p. 290, pl. xii, figs. 1–3.
Corycæus (*Onychocorycæus*) *catus*, M. Dahl, 1912, p. 99, pl. xiii, figs. 17–24.
Corycæus obtusus, Giesbrecht, (part), p. 673, pl. li, figs. 12–14.

OCCURRENCE:

Sta. 61 A, Northern area of Arabian Sea, surface, several males.

DESCRIPTIVE NOTES.—♂. The total length ranges from 0·80 to 0·867 mm., with a mean of 0·841 mm. The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
343	99	55	96 (35, 61)	24	219	72	90 = 1000.

The cephalon and 1st thoracic segment are fused, but in stained specimens a darkly stained line, marking the line of fusion, can be seen crossing the dorsum.

The genital segment consists of a large oval region and a very short posterior cylindrical portion; there is a small hook anteriorly on the ventral aspect. The genital aperture is armed with a delicate seta, on the inner side of which is a small triangular tooth.

In the following table I have given the various proportional lengths of different regions of the body, and for reference I have given the corresponding measurements as given by M. Dahl, recalculated as parts per 100 :

Dimensions.	From M. Dahl.	Present examples.	
		(1).	(2).
Anterior region to posterior	59 to 41 (35 : 24)	59 to 41	61 to 39
Cephalon—Th. 1 to total length	47·5 ,, 100 (28 : 59)	44·2 ,, 100	46 ,, 100
Genital segment :			
(*a*) Cylindrical region to total length	11 ,, 100 (4 : 36)	14 ,, 100	12 ,, 100
(*b*) Breadth to length of oval region	69 ,, 100 (22 : 32)	68 ,, 100	..
Breadth to length of anal segment	69 ,, 100 (9 : 13)	63 ,, 100	..
Anal segment to furcal ramus	86 ,, 100 (13 : 15)	86 ,, 100	86 to 100
Short furcal spine to long seta	19 ,, 100 (6 : 32)	23 ,, 100	26 ,, 100

The 1st antenna consists of the usual six segments having the proportional lengths of 20, 16, 16, 25, 12, 11.

The 2nd antenna more nearly approaches the condition figured by M. Dahl (pl. xiii, fig. 15) in *C. ovalis* Claus. Of the two basal spines the shorter, arising from the base of the 3rd segment, reaches to the spine on the anterior margin of the 3rd segment; the longer, arising from the 2nd segment, reaches well beyond the tip of the shorter. The shorter claw, arising from the proximal joint of the end region, is long and slender; the long distal claw reaches well beyond the base of the 2nd basal segment.

The swimming legs exhibit the usual characters, and there does not appear to be any distinguishing character in these appendages that will serve to discriminate between the various species.

DISTRIBUTION.—According to M. Dahl this is an Indo-Pacific species. It has been recorded from the Australian Barrier Reefs (Farran), the Aru Archipelago (Früchtl), off Christmas Island (Farran) and from the Arabian Sea (present record).

Corycæus (*Onychocorycæus*) *pacificus* F. Dahl.

Corycæus (*Onychocorycæus*) *pacificus*, M. Dahl, 1912, p. 103, pl. xiv, figs. 1–10.
Corycæus obtusus, Farran, 1911, p. 291, pl. xii, figs. 4–6.

OCCURRENCE :

Sta. 61 A, Northern area of Arabian Sea, surface.
Sta. 61 C, Northern area of Arabian Sea, surface.

DESCRIPTIVE NOTES.—♀. The total length ranges from 1·067 to 1·108 mm., with a mean of 1·073 mm. This is slightly larger than the measurement given by Farran for examples from Christmas Island, 1·05 to 1·1 mm., and also on the average slightly smaller than that given by M. Dahl of 1·09 mm.

The proportional lengths of the anterior and posterior regions of the body are as 66 to 34. The proportional lengths of the various segments of the body are as follows :

Cephalon.	Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
367	123	52	94	25	190	77	72 = 1000

In the following table I have given the proportional lengths in *ovalis* and *pacificus* of the cephalothorax and abdomen and of the three segments of the hind region of the body in parts per 100, and have recalculated the dimensions as given by M. Dahl:

	ovalis. (M. Dahl).	*pacificus.* Present examples.	*pacificus.* (M. Dahl).
Cephalothorax	67 (50)	66	63 (51)
Abdomen	33 (25)	34	37 (30)
,, 1	60 (36)	56	55 (38)
,, 2	20 (12)	23	22 (15)
Furca	20 (12)	21	23 (16)

It seems clear that the present examples are intermediate between the Pacific form, *pacificus*, and the Mediterranean form, *ovalis*, and the sole distinction between these forms appears to be the presence of a sharp spinous termination to the lateral process of the 4th thoracic segment in *ovalis* and its absence in *pacificus*; I am therefore inclined to regard them as local races of the same species.

The cephalon and 1st thoracic segment are only partially fused, the line of demarcation between them being visible on the dorsal aspect, and in specimens that have been subjected to pressure the chitin splits along this line. The posterior processes of the 4th thoracic segment terminate in small blunt prominences, as figured by Farran (1911, pl. xii, fig. 5). The posterior border of the genital segment and the margin of the articulation with the furcal ramus on each side of the 2nd abdominal segment are armed with rows of small spinules on the ventral aspect.

In the same haul were a number of males that agree very closely with the description given by M. Dahl.

♂. The total length ranges from 0·98 to 1·03 mm. The proportional lengths of the anterior and posterior regions of the body are as 55 to 45, which agrees exactly with the measurements given by M. Dahl, viz. 39 to 32 (= 54·9 to 45·1). The proportional lengths of the various segments of the body are as follows:

Cephalon.	Th. 1.	Th. 2.	Th. 3–4.	Th. 5.	Abd. 1.	Abd. 2.	Furca.
322	86	40	95	21	236	91	109 = 1000

As in the female the cephalon and 1st thoracic segment are only partially fused, and in stained specimens the line of fusion is easily detectable as a deeply stained line running across the dorsum and down the side nearly to the lateral margin.

The 4th thoracic segment is produced backwards on each side in a wing that terminates in a short pointed spine. The 5th thoracic segment bears two small delicate setae.

The genital segment is five-ninths as broad as long, the actual proportions being 37 to 63. The genital aperture is guarded by a seta, on the inner side of which is a small triangular spinule. There is no spinous projection on the ventral aspect of the segment.

The 1st antenna resembles that of the female.

In the 2nd antenna the basal part appears to be composed of three segments, of which the proximal is small and incompletely annular in shape.

Distribution.—In the Pacific Ocean this has been recorded from New Pommerania, New Guinea and the Philippine Islands (M. Dahl), the China Sea (M. Dahl), the Australian

Barrier Reefs (Farran) and the Malay Archipelago (A. Scott, as *obtusus*). In the Indian Ocean it has been taken off Ceylon (Thompson and A. Scott as *obtusus*, M. Dahl), the Laccadive Sea and Maldive Archipelagoes (Thompson and A. Scott), Arabian Sea (Thompson and A. Scott, present record), the Gulf of Aden, Red Sea and Gulf of Suez (Thompson and A. Scott), off Zanzibar (M. Dahl).

Corycæus (*Onychocorycæus*) *pumilus* M. Dahl.

Corycæus (*Onychocorycæus*) *pumilus*, M. Dahl, 1912, p. 91, pl. xii, figs, 21–28.

Occurrence :

Sta. 56, South Arabian coast, surface, 1 female, ovigerous.
Sta. 61, Northern area of Arabian Sea, surface, 1 female.

Descriptive Notes.—♀. Total length from 0·65 mm. to 0·73 mm. The spine of the 3rd thoracic segment is sharply pointed and reaches to two-thirds the length of the genital segment. The proportional lengths of the segments of the abdomen and the furcal rami are as 60·3 : 22·4 : 17·3. The anal segment tapers posteriorly, so that the anterior diameter is half as long again as the posterior, the proportions being as 15 to 10 ; M. Dahl gives 10 to 8 (= 15 to 12) for her specimens. The furcal rami are slightly more than twice as long as broad and measure 10 by 4·5. Each furcal ramus bears a short spine less than half the length of the ramus itself, but the inner seta is somewhat longer than is stated by M. Dahl, who gives the proportions of the seta and the furcal ramus as 10 : 6 ; in the present specimens the proportional lengths are as 30 : 10.

The 1st antenna consists of the usual six segments, that have the proportional lengths of 19, 14, 18, 25, 13, 11.

The 2nd antenna closely resembles the figure given by M. Dahl (1912, pl. xii, fig. 25).

In the swimming feet the exopods (including the endspines) have the following relative lengths : 48 : 64 : 59 : 16. These figures agree extremely closely with the proportional lengths given by M. Dahl of the 1st three legs.

The figure which M. Dahl (1912, pl. xii, fig. 28) gives of the 2nd leg of the female appears to have been taken from an abnormal specimen, since there are only two marginal spines on the 3rd segment of the exopod. In the present specimen there are the usual three marginal spines.

Remarks.—I am very doubtful whether the distinction between *pumilus* M. Dahl and *medius* Gurney can be maintained. M. Dahl's specimens from the Bismark Archipelago possessed a total length of (♀) 0·65–0·68 mm. and (♂) 0·63–0·65 mm., while Gurney's examples from the Suez Canal measured (♀) 0·74–0·8 mm. and (♂) 0·66 mm. The present examples, which are both females, measure 0·65 and 0·73 mm. respectively, and are thus intermediate between the two forms. It is now well known that the size of a species may vary quite considerably in accordance with the degree of salinity of the water in which it is living. We should thus expect to find that examples of the same species were considerably larger in the Suez Canal, where the salinity may be as high as 35·5 at Port Said, 52·2 in the Great Bitter Lake and 43·8 in the Gulf of Suez,* whereas in the Bismark Archipelago the salinity is approximately 34·5 or less.†

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* Munro Fox, 1926, ‘ Zoological Results of the Cambridge Expedition to the Suez Canal,’ 1924, Pt. I, p. 30.

† Gerhard Schott, 1935, ‘ Geographie des Indischen und Stillen Ozeans,’ pl. xxvii.

In the following Table I have given the proportional lengths and dimensions of the various parts of the body in the two "species" and in the present specimens :

Dimension.	*pumilus* M. Dahl.	Present examples.	*medius* Gurney.
♀.			
Total length	0·65–0·68 mm.	0·65–0·73 mm.	0·74–0·8 mm.
Proportions of thorax to abdomen	70 : 30 (35 : 15)	67 : 33	65 : 35
1st th. segment to whole body	58 : 100 (29 : 50)	52 : 100	"Nearly half."
Breadth to length of segment th. 1	Three-fourths	..	Three-fourths.
Spine of th. 3	Pointed and over-reaches two-thirds of genital segment	Sharply pointed and reaches to two-thirds of genital segment	Very sharp and reaches beyond middle of genital segment
Proportional lengths of abdominal segments	57 : 27 : 17 60 : 24 : 16 (20 or 22 : 9 : 6)	60·3 : 22·4 : 17·3	59·2 : 22·4 ; 18·4
Breadth to length of furcal ramus	50 : 100 (3 : 6)	45 : 100	39 : 100 (7 : 18)
Long furcal seta to furcal length	100 : 60 (10 : 6)	100 : 33	100 : 24 (37 : 9)
♂.			
Total length	0·63–0·65 mm.	..	0·66 mm.
Proportions of thorax to abdomen	60 : 40	..	61 : 39
Proportional lengths of abdominal segments	51 : 24·5 : 24·5 (24 : 11·5 : 11·5)	..	50·8 : 24·6 : 24·6 (31 : 15 : 15)

Farran (1936, p. 138) remarks that the examples of what he takes to be *pusilus* M. Dahl from Christmas Island, while differing from the original description in some respects, comes nearer to it than to *medius* Gurney, except in the length of the long furcal seta, which was more than four times the length of the furcal ramus, thus agreeing with *medius*.

Distribution.—*C. pumilus* M. Dahl has now been recorded from the Bismark Archipelago (M. Dahl), the Australian Barrier Reefs (Farran), the Indian Ocean (M. Dahl) and the Arabian Sea (present record). If I am right in thinking that *C. medius* Gurney is a synonym, the species extends to the Red Sea and Suez Canal.

Sub-genus *Corycella* Farran.

Corycæus (*Corycella*) *gibbulus* Giesbrecht.

Corycœus gibbulus, Giesbrecht, 1892, p. 675, pl. li, figs. 22–23 ; Cleve, 1901, p. 41, pl. iv, figs. 3–10.
Corycœus (*Corycella*) *gibbulus*, M. Dahl, 1912, p. 115, pl. xv, figs. 1–4, 9, 10, 25, 35, 36.
Corycœus pellucidus, Wolfenden, 1906, p. 1027, pl. xcix, figs. 4–11.

Occurrence :

Sta. 61 A, Northern area of Arabian Sea, surface.

Sta. 61 C, Northern area of Arabian Sea, surface, numerous specimens of both sexes.

Sta. 136, Maldive area, surface, 5 females.

Descriptive Notes.—This species was by far the commonest among the Corycæidæ, and was especially numerous in the day haul at Sta. 61. ♀. Total length ranged from

0·85 to 1·0 mm., with a mean of 0·925 mm. ♂. Total length ranged from 0·817 to 0·950, with a mean of 0·882 mm.

Remarks.—A number of specimens, especially the females, are infected with a parasite that appears to be identical with *Blastodinium mangini* Chatton (Chatton, 1920).

Distribution.—M. Dahl states that this species appears to be confined to the Indo-Pacific region. It has been recorded from the Pacific Ocean in lat. 3°–15° N., long. 99°–138° W. (Giesbrecht) and from the Australian Barrier Reefs (Farran). In the Indian Ocean it has been taken off Christmas Island (Farran), in the Nicobar Islands (Sewell), the Bay of Bengal (Thompson), the Ceylon Pearl Banks (Thompson and A. Scott), the Maldive and Laccadive Archipelagoes (Wolfenden, as *pellucidus*), the equatorial region of the Indian Ocean (Thompson), the Arabian Sea, Gulf of Aden and Red Sea (present record, Cleve, Thompson and A. Scott), the Gulf of Suez (Thompson and A. Scott), and off the south-east coast of Africa (Wolfenden, as *pellucidus*). Wolfenden (1911, p. 359) has, however, also recorded *pellucidus* from several of the " Gauss " stations in the tropical Atlantic region.

HARPACTICOIDA.

Family Ectinosomidæ.

Genus *Ectinosoma* Boeck.

Ectinosoma melaniceps Boeck.

Ectinosoma melaniceps, Sewell, 1940, p. 139.

Occurrence :

Sta. 61, Northern area of Arabian Sea, surface.
Nankauri Harbour, Nicobar Islands, surface.

Distribution.—This species appears to have a wide distribution throughout the three great oceans, extending into both the Arctic and Antarctic regions.

Genus *Microsetella* Brady and Robertson.

Microsetella norvegica (Boeck).

Microsetella norvegica, Sewell, 1940, p. 140.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, a few examples.

Distribution.—As I have pointed out in a previous paper (1940), this species occurs in all three great oceans, and has a range extending from lat. 66° S. in the Antarctic to Franz-Josef Land in the Arctic Ocean.

Microsetella rosea Dana.

Microsetella rosea, Giesbrecht, 1892, p. 550, pl. xliv, figs. 32, 35, 38, 41, 43, 48, 49.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, a few examples.

Distribution.—This species has a wide distribution in all three great oceans. It has been recorded from the San Diego region of the Pacific coast of America (Esterly), between lat. 0°–11° N., long. 108°–124° W. (Giesbrecht), the Sulu Sea (Dana), off New Zealand

(Farran), in Fortescue Straits between Basilisk and Moresby Islands (A. Scott), in the Aru Archipelago (Früchtl) and in the Malay Archipelago (A. Scott). In the Indian Ocean it occurs off the Madras coast of India (Menon), on the Ceylon Pearl Banks, the Laccadive Sea and the Maldive and Laccadive Archipelagoes (Thompson and A. Scott), the Arabian Sea (Cleve, Thompson and A. Scott, present record), the Gulf of Aden (Thompson and A. Scott), the Red Sea (Cleve, Thompson, Thompson and A. Scott), the Gulf of Suez (Thompson, Thompson and A. Scott) and off the east coast of Africa in the Mozambique channel (Thompson). In the Atlantic Ocean it has been recorded from the South Atlantic as far as lat. 50° S. (Farran), in the temperate South Atlantic in lat. 26° 25′ S., long. 42° W. (T. Scott), the tropical Atlantic (Farran), the north temperate Atlantic (Rose, T. Scott, van Breemen), in the Woods Hole region of the east coast of America (Fish, Wilson), round the British Isles (Brady) and in the Mediterranean Sea (Giesbrecht, Cleve, Thompson and A. Scott, Pesta, Rose).

Family Tachidiidæ.

Genus *Euterpina* Norman.

Euterpina acutifrons (Dana).

Euterpina acutifrons, Sewell, 1940, p. 141.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, a few examples.

Distribution.—Widely distributed throughout the three great oceans.

Family Macrosetellidæ.

Genus *Macrosetella* A. Scott.

Macrosetella gracilis (Dana).

Macrosetella gracilis, Sewell, 1940, p. 141.

Occurrence :

Sta. 56, South coast of Arabia, surface, 11 specimens.
Sta. 61 C, Northern area of Arabian Sea, surface, several specimens.
Ńankauri Harbour and Expedition Harbour, Nicobar Islands, surface.

Distribution.—Widely distributed throughout all three great oceans. It has also been recorded from Kerguelen Island and the Antarctic (Brady).

Macrosetella oculata (Sars).

Setella oculata, Sars, 1916, p. 13, pl. vii.
Miracia gracilis, Mrazek, 1894, p. 1, pl. xiv, figs. 4–17.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, 2 specimens.

Distribution.—This species has now been recorded from the southern Pacific Ocean (Dana), the southern part of the Indian Ocean in lat. 24° 15′ S., long 63° 30′ E., the Arabian Sea (present record), the North Atlantic (Sars) and the Woods Hole region of the east coast of North America (Wilson).

Genus *Miracia* Dana.

Miracia efferata Dana.

Miracia efferata, Sewell, 1940, p. 141.

Occurrence :

Sta. 61, Northern area of Arabian Sea, surface, 1 specimen.

"Investigator" Sta. 614, Nankauri Harbour, Nicobar Islands.

Distribution.—This species appears to be widely distributed throughout the three great oceans. It has been recorded from the South Pacific (Brady), 140 miles N.W. of New Zealand (Farran), in the south-east part of the Indian Ocean (Mrazek), in the Nicobar Islands (Sewell), the Bay of Bengal (Thompson, Mrazek), the Laccadive Sea (Mrazek, Thompson and A. Scott), the Maldive and Laccadive Archipelagoes (Thompson and A. Scott, Wolfenden), the southern region of the Arabian Sea (Thompson), the northern region of the Arabian Sea (A. Scott, present record), off the east coast of South Africa (Mrazek, Thompson), the Gulf of Guinea (T. Scott, Lubbock), the tropical Atlantic (Dana, Mrazek, Farran), the temperate region of the North Atlantic (Giesbrecht, Mrazek, Farran) and the Woods Hole Region of the east coast of North America (Wilson).

Family CLYTEMNESTRIDÆ.

Genus *Clytemnestra* Dana.

Clytemnestra rostrata (Brady).

Goniopsyllus rostratus, Brady, 1883, p. 107, pl. xlii, figs. 9–16.
Clytemnestra rostrata, Giesbrecht, 1892, p. 566, pl. xlv, figs. 19, 20, 22, 25, 26, 31, 33.

Occurrence.—Sta. 61 C, Northern area of Arabian Sea, surface, a few specimens.

Distribution.—The San Diego region of the coast of California (Esterly), the eastern tropical area of the Pacific Ocean (Giesbrecht), the Malay Archipelago (A. Scott), the Ceylon Pearl Banks, the Arabian Sea, the Gulf of Aden and the Red Sea (Thompson and A. Scott), the South Atlantic Ocean (Brady), the Gulf of Guinea (T. Scott), the North Atlantic Ocean (van Breemen), the Woods Hole region of the east coast of North America (Wheeler, Wilson) and the Mediterranean Sea (Giesbrecht, Steuer, Früchtl, Pesta, Rose).

Clytemnestra scutellata Dana.

Clytemnestra scutella, Giesbrecht, 1892, p. 566, pl. xlv, figs. 16–18, 21, 23, 24, 27–30, 32, 34–38; Sewell, 1940, p. 142.

Occurrence :

Sta. 61, Northern area of Arabian Sea, surface.

The Nicobar Islands, surface.

Distribution.—This species appears to be widely distributed throughout all three great oceans.

Family Pontostratiotidæ.

Genus *Ægisthus* Giesbrecht.

Ægisthus aculeatus Giesbrecht.

Ægisthus aculeatus, Sewell, 1940, p. 142.

Occurrence.—" Investigator " Sta. 682, Laccadive Sea, lat. 10° 26′ N., long. 74° 32′ 30″ E., surface.

Distribution.—In all three great oceans.

Ægisthus mucronatus Giesbrecht.

Ægisthus mucronatus, Sweell, 1940, p. 142.

Occurrence.—" Investigator " Sta. 682, Laccadive Sea, lat. 10° 26′ N., long. 74° 32′ 30″ E., surface.

Distribution.—In all three great oceans.

APPENDIX.

A LIST OF SPECIES AND THE NUMBERS OF INDIVIDUALS CAPTURED AT DIFFERENT STATIONS.

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
42	0	*Sapphirina iris* Dana	2	1	—
43	83	*S. iris* Dana	31	6	—
45	38	*Calanoides patagoniensis* Brady	—	—	1
		Labidocera acuta (Dana)	—	1	—
56	0	*Nannocalanus minor* (Claus)	—	1	—
		Canthocalanus pauper (Giesbrecht)	3		—
		Schmackeria serricaudata (T. Scott)	Several		—
		Pseudodiaptomus salinus (Giesbrecht)	— —	1	—
		Temora discaudata Giesbrecht	—	5	—
		T. turbinata (Dana)	3	2	—
		Calanopia elliptica (Dana)	—	2	—
		Labidocera acuta (Dana)	3	57	—
		L. acutifrons (Dana)	2	1	—
		L. minuta Giesbrecht	1	12	—
		Oithona brevicornis Giesbrecht	—	—	—
		O. nana Giesbrecht	—	—	—
		Oncœa conifera Giesbrecht	—	—	—
		Sapphirina iris Dana		1	—
		Corycæus agilis Dana	10	23	
		C. asiaticus F. Dahl	1	2	—
		C. lubbocki Giesbrecht	1	—	—
		C. pumilus M. Dahl	1	—	—
		Macrosetella gracilis (Dana)	11		—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
58	0	*Schmackeria serricaudata* (T. Scott)	Several		—
		Labidocera acuta (Dana)	11		—
		L. acutifrons (Dana)	—	1	—
61 A	0	*Nannocalanus minor* (Claus)	120		—
		Calocalanus pavo (Dana)	240		—
		Paracalanus denudatus Sewell	240		—
		Acrocalanus longicornis Giesbrecht	360		—
		A. monachus Giesbrecht	240		—
		Clausocalanus furcatus (Brady)	120		—
		Euchæta wolfendeni A. Scott	960		—
		Centropages gracilis (Dana)	1,200		—
		C. orsinii Giesbrecht	120		—
		Acartia amboinensis Carl	120		—
		Oncæa media Giesbrecht	6,482		—
		Corycæus agilis Dana	360		—
		C. crassiusculus Dana	12	3	—
		C. speciosus Dana	Several		—
		C. catus F. Dahl	—	Several	—
		C. pacificus F. Dahl	—	—	—
		Corycella gibbulus Giesbrecht		Numerous	
	500	*Euchirella bella* Giesbrecht	1	—	—
	1000	*Eucalanus elongatus* (Dana)	4		—
		Rhincalanus nasutus Giesbrecht	7		—
		Euchirella bella Giesbrecht	1	—	—
		Euchæta marina (Prestandrea)	18	—	—
		E. wolfendeni A. Scott	6		—
		Lucicutia challengeri Sewell	12		—
		Euaugaptilus latifrons Sars	—	—	1
		E. nodifrons Sars	12		—
		Centraugaptilus horridus (Farran)	2		—
		Pachyptilus eurygnathus Sars	1	—	—
		Pontella securifer Brady	3	—	—
		Sapphirina ovatolanceolata-gemma Dana	—	1	—
		Copilia mirabilis Dana, f. *typica*	—	3	—
		C. quadrata Dana	—	1	—
	1500	*Eucalanus elongatus* (Dana)	100		—
		E. mucronatus Giesbrecht	—	—	—
		E. pseudattenuatus sp. nov.	7		—
		Rhincalanus nasutus Giesbrecht	6		—
		Gætanus antarcticus Wolfenden	2	—	2
		G. curvicornis Sars	2	—	—
		Euchirella bella Giesbrecht	8	—	—
		E. maxima Wolfenden	1	—	1
		Pseudochirella notacantha Sars	—	—	1
		Pseudeuchæta brevicauda Sars	1	—	1
		Valdiviella oligarthra Steuer	1	—	—
		Euchæta marina (Prestandrea)	38	3	—
		E. murrayi sp. nov.	1	—	—
		E. wolfendeni A. Scott	14	—	—
		Paraeuchæta bisinuata Sars	1	—	—
		Lophothrix humilifrons Sars	1	—	—
		Metridia princeps Giesbrecht	4	—	2
		Lucicutia challengeri Sewell	11		—
		Heterostylites longicornis (Giesbrecht)	1	1	—
		Hemirhabdus truncatus (A. Scott)	—	—	1
		Haloptilus chierchiæ (Giesbrecht)	59		—
		Euaugaptilus angustus Sars	1	—	—
		E. digitatus Sars	1	—	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
61 A (*cont.*)	1500 (*cont.*)	*E. elongatus* Sars	1	—	—
		E. grandicornis Sars	2	—	—
		E. laticeps Sars	3	—	1
		E. longimanus Sars	1	—	—
		E. magnus (Wolfenden)	—	—	3
		E. nodifrons Sars	22		—
		E. penicillatus Sars	1	—	—
		E. tenuispinus Sars	1	—	—
		Centraugaptilus horridus (Farran)	1	—	—
		Pachyptilus eurygnathus Sars	2	—	—
		P. lobatus	1	—	—
		Candacia pachydactyla (Dana)	1	—	—
		Pontella securifer Brady	1	—	—
		Copilia mediterranea (Claus)	—	6	—
		C. mirabilis Dana	—	5	—
	2000	*Undinula darwini* (Lubbock)	3	—	2
		Euchæta marina (Prestandrea)	1	2	—
		E. wolfendeni A. Scott	8	2	—
		Centropages gracilis (Dana)	1	1	—
		Haloptilus acutifrons (Giesbrecht)	1	—	—
		Euaugaptilus magnus (Wolfenden)	1	—	—
		Labidocera detruncata (Dana)	2	1	—
		Oncæa venusta Philippi	19	3	—
61 C	0	*Nannocalanus minor* (Claus)	14,280		—
		Canthocalanus pauper (Giesbrecht)	360		—
		Undinula darwini (Lubbock)	3,120		—
		U. vulgaris (Dana)	240		—
		Eucalanus attenuatus (Dana)	19	7	—
		E. pileatus Giesbrecht	120		—
		E. pseudattenuatus sp. nov.	112	3	9
		E. subcrassus Giesbrecht	Several		
		E. subtenuis Giesbrecht	—	—	—
		Paracalanus aculeatus Giesbrecht	10,680		—
		P. denudatus Sewell	8,280		—
		P. parvus Giesbrecht	2,760		—
		Acrocalanus longicornis Giesbrecht	360		—
		A. monachus Giesbrecht	—	—	—
		Calocalanus pavo (Dana)	Many		
		C. plumulosus (Claus)	Several		
		Clausocalanus arcuicornis (Dana)	Numerous		
		C. farrani Sewell	360		—
		C. furcatus (Brady)	11,280		—
		Euchirella orientalis Sewell	—	2	—
		Euchæta consimilis Farran	3	—	—
		E. marina (Prestandrea)	1,205		—
		E. wolfendeni A. Scott	7,086		—
		Scolecithricella tenuiserrata (Giesbrecht)	1	—	—
		Centropages calaninus (Dana)	—	1	
		C. gracilis (Dana)	Numerous		
		C. orsinii Giesbrecht	,,		
		Lucicutia flavicornis (Claus)	1	—	—
		Candacia æthiopica (Dana)	120		—
		C. curta (Dana)	120		—
		C. pachydactyla (Dana)	1	—	—
		Labidocera detruncata (Dana)	3,290		—
		Pontella securifer Brady	59	21	—
		Acartia amboinensis Carl	Several		
		A. erythræa Giesbrecht	—	—	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
61 C (*cont.*)	0 (*cont.*)	*A. pietschmani* Pesta	1	—	—
		Oithona fallax Farran	2	—	—
		O. plumifera Baird	Numerous		
		O. rigida Giesbrecht	1	—	—
		Oncœa clevei Früchtl	Several		
		O. conifera Giesbrecht	1	—	—
		O. media Giesbrecht	Several		
		O. venusta Philippi	Numerous		
		Sapphirina bicuspidata Giesbrecht	1	—	—
		S. nigromaculata Claus	5	3	—
		S. ovatolanceolata-gemma Dana	2	—	—
		S. sinuicauda Brady	1	1	—
		S. stellata Giesbrecht	1	—	—
		Copilia mirabilis Dana	120		—
		Corycæus agilis Dana	120		—
		C. crassiusculus Dana	8	—	—
		C. pacificus F. Dahl	—	—	—
		C. speciosus Dana	Several		
		Corycella gibbula Giesbrecht	1,720	1,560	—
		Ectinosoma melaniceps Boeck	—	—	—
		Macrosetella gracilis (Dana)	120		—
		M. oculata (Sars)	2	—	—
		Miracia efferata Dana	1	—	—
		Clytemnestra rostrata (Brady)	Few		
		C. scutellata Dana	—	—	—
	1000	*Eucalanus elongatus* (Dana)	33		—
		Rhincalanus nasutus Giesbrecht	2		—
		Euchirella bella Giesbrecht	14	1	4
		Euchæta marina (Prestandrea)	104	12	—
		E. murrayi sp. nov.	5	—	—
		E. wolfendeni A. Scott	63	8	—
		Labidocera detruncata (Dana)	11	11	—
		Copilia mediterranea (Claus)	—	6	—
		C. mirabilis Dana, f. *typica*	—	23	—
		C. quadrata Dana	—	8	—
		C. vitrea (Haeckel)	—	2	—
	1500	*Calanus finmarchicus* (Gunnerus)	—	1	
		Nannocalanus minor (Claus)	5	2	
		Eucalanus elongatus (Dana)	43		
		E. pseudattenuatus sp. nov.	15		
		Rhincalanus nasutus Giesbrecht	2		—
		Gœtanus curvicornis Sars	1		—
		Euchirella bella Giesbrecht	3	—	—
		Euchæta marina (Prestandrea)	40	2	—
		E. murrayi sp. nov.	2	—	—
		E. wolfendeni A. Scott	9	—	—
		Amallothrix indica Sewell	1	—	—
		Metridia princeps Giesbrecht	—	1	—
		Mesorhabdus angustus Sars	1	—	—
		Euaugaptilus angustus Sars	1	—	—
		E. grandicornis Sars	5	—	2
		E. latifrons Sars	1	—	—
		E. magnus (Wolfenden)	4	—	2
		E. nodifrons Sars	17		—
		E. oblongus Sars	1	—	—
		Centraugaptilus horridus Farran	1	—	—
		Haloptilus chierchiæ (Giesbrecht)	26	1	—
		Pachyptilus eurygnathus Sars	6	—	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
61 C (*cont*).	1500 (*cont*).	*Heteroptilus* sp.	—	1	—
		Candacia varicans Giesbrecht	—	1	
		Labidocera detruncata (Dana)	—	2	—
		Pontellopsis regalis (Dana)	—	1	—
		Copilia mediterranea (Claus)	—	8	—
		C. mirabilis, f. *typica* Dana	—	38	—
		C. mirabilis, f. *platonyx* Lehnhofer	—	2	—
		C. quadrata Dana	—	2	—
	2000	*Nannocalanus minor* (Claus)	9	1	1
		Eucalanus elongatus (Dana)	1	—	—
71	106	*E. elongatus* (Dana)	3	—	—
76	200	*E. elongatus* (Dana)	41	10	—
		E. crassus Giesbrecht	16		—
		Rhincalanus nasutus Giesbrecht	44		—
		Euchæta marina (Prestandrea)	4	—	—
		E. wolfendeni A. Scott	11	—	—
		Candacia curta (Dana)	4	—	—
		Labidocera acuta (Dana)	6	2	—
		Copilia mediterranea (Claus)	—	2	—
		C. mirabilis Dana	—	41	—
	600	*Calanoides patagoniensis* Brady	—	—	3
		Eucalanus attenuatus (Dana)	50		—
		E. crassus Giesbrecht	9	—	—
		E. elongatus (Dana)	2,061	29	—
		Rhincalanus nasutus Giesbrecht	803	—	—
		Euchirella maxima Wolfenden	1	1	1
		Euchæta marina (Prestandrea)	1	—	—
		E. murrayi sp. nov.	1	—	—
		E. wolfendeni A. Scott	5	—	—
		Mesorhabdus angustus Sars	1	1	1
		Disseta palumboi Giesbrecht	1	—	—
		Haloptilus acutifrons (Giesbrecht)	1	—	—
		Labidocera acuta (Dana)	1	—	—
		Copilia mirabilis (Dana)	—	14	—
	1500	*Calanoides patagoniensis* Brady	—	—	2
		Eucalanus elongatus (Dana)	351		—
		E. crassus Giesbrecht	7	1	—
		E. mucronatus Giesbrecht	—	—	—
		Euchirella bella Giesbrecht	2	—	—
		Euchæta murrayi sp. nov.	1	—	—
		E. wolfendeni A. Scott	4	—	—
		Onchocalanus affinis With	—	—	1
		Scaphocalanus magnus (T. Scott)	1	—	—
		Metridia princeps Giesbrecht	1	—	—
		Pleuromamma indica Wolfenden	2	—	—
		Lucicutia challengeri Sewell	61	12	12
		Euaugaptilus longimanus Sars	—	—	1
		E. nodifrons Sars	2	—	—
		Centraugaptilus horridus Farran	3	—	—
		Haloptilus chierchiæ (Giesbrecht)	50	2	—
		Phyllopus impar Farran	1	—	—
		Pachyptilus eurygnathus Sars	1	—	—
		Candacia curta (Dana)	2	—	—
		Pontella securifer Brady	1	—	—
	2500	*Bathycalanus bradyi* (Wolfenden)	1	—	—
		Gætanus antarcticus Wolfenden	1	—	—
95	983–430	*Gaussia princeps* (T. Scott)	1	2	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
96	14	*Eucalanus crassus* Giesbrecht	2	—	—
		E. mucronatus Giesbrecht	—	—	—
		E. subcrassus Giesbrecht	2	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	867		—
		R. nasutus Giesbrecht	13		—
		Paracalanus aculeatus Giesbrecht	2	1	1
		P. denudatus Sewell	3	—	—
		Acrocalanus longicornis Giesbrecht	2	—	—
		Calocalanus pavo (Dana)	2	—	—
		Euchæta marina (Prestandrea)	6	1	—
		E. wolfendeni A. Scott	11	1	—
		Oithona plumifera Baird	7	1	—
		Sapphirina angusta Dana	1	2	—
		S. nigromaculata Claus	1	2	—
		S. ovatolanceolata-gemma Dana	2	—	—
		Copilia lata Giesbrecht	10	—	—
		C. mirabilis Dana	19	4	—
	645-400	*Megacalanus princeps* Wolfenden	—	—	1
		Eucalanus attenuatus (Dana)	182	119	—
		E. elongatus (Dana)	254	4	—
		E. mucronatus Giesbrecht	—	—	—
		E. pseudattenuatus sp. nov.	4	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	71		—
		R. nasutus Giesbrecht	942		—
		Gætanus kruppi Giesbrecht	4	—	5
		G. miles Giesbrecht	6	—	1
		G. pileatus Farran	3	—	1
		Euchirella bella Giesbrecht	1	1	—
		E. galeata Giesbrecht	22	—	33
		E. orientalis Sewell	40	2	5
		Chirundina indica Sewell	12	2	5
		C. streetsi Giesbrecht	—	—	4
		Pseudochirella magna (Wolfenden)	1	—	—
		Undeuchæta bispinosa Esterly	1	1	3
		Euchæta marina (Prestandrea)	78	3	—
		E. tenuis Esterly	20	—	—
		E. wolfendeni A. Scott	3	—	—
		Paraeuchæta investigatoris Sewell	16	4	—
		P. tonsa Giesbrecht	—	1	—
		P. weberi A. Scott	1	—	—
		Onchocalanus trigoniceps Sars	—	—	1
		Scottocalanus dauglishi Sewell	59	34	—
		Scaphocalanus magnus (T. Scott)	5	—	1
		Lophothrix frontalis Giesbrecht	4	—	3
		Amallothrix indica Sewell	5	—	—
		Centropages gracilis (Dana)	1	—	—
		Metridia princeps Giesbrecht	—	1	—
		Pleuromamma xiphias (Giesbrecht)	321	155	—
		Lucicutia challengeri Sewell	2	—	1
		Heterorhabdus spinifrons (Claus)	—	2	—
		H. abyssalis (Giesbrecht)	4	1	—
		Disseta palumboi Giesbrecht	1	—	1
		Euaugaptilus magnus (Wolfenden)	2	—	—
		E. nodifrons Sars	2	1	—
		Haloptilus validus Sars	1	—	—
		Arietellus plumifer Sars	1	—	2
		A. simplex Sars	1	—	—
		Sapphirina angusta Dana	—	2	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
96	645–400	*S. opalina-darwini* Haeckel	22	13	—
(*cont.*)	(*cont.*)	*S. ovatolanceolata-gemma* Dana	—	1	—
		Copilia lata Giesbrecht	2	1	—
		C. mirabilis Dana	—	8	—
98	2800	*Megacalanus princeps* Wolfenden	1	—	—
		M. princeps var. *inermis* nov.	1	—	—
120	2926	*Bradycalanus gigas* sp. nov.	1	—	—
131 A	600	*Paraeuchæta sarsi* Farran	1	—	—
131 D	500	*Neocalanus gracilis* (Dana)	9	—	1
		N. robustior (Giesbrecht)	2	—	3
		Megacalanus princeps Wolfenden	1	—	—
		Eucalanus attenuatus (Dana)	6	—	—
		E. elongatus (Dana)	3	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	26		—
		Gætanus pileatus Farran	—	—	1
		Euchirella truncata Esterly	1	1 ?	1
		Euchæta marina (Prestandrea)	76	2	—
		E. media Giesbrecht	2	—	—
		E. tenuis Esterly	1	—	—
		Paraeuchæta scotti (Farran)	1	—	—
		Scottocalanus persecans (Giesbrecht)	1	1	—
		S. securifrons (T. Scott)	2	2	—
		Pleuromamma abdominalis (Lubbock)	2	4	12
		P. quadrungulata (F. Dahl)	6		—
		P. xiphias (Giesbrecht)	3	2	—
		Heterostylites longicornis (Giesbrecht)	1	—	—
		Haloptilus mucronatus (Claus)	1	—	—
		H. ornatus (Giesbrecht)	2	—	—
		H. oxycephalus (Giesbrecht)	1	—	—
		Arietellus giesbrechti Sars	1	—	—
		Candacia æthiopica (Dana)	1	—	—
		C. bipinnata Giesbrecht	4	—	—
		C. curta (Dana)	1	1	—
		C. longimana Claus	—	3	—
		C. pachydactyla (Dana)	2	1	—
		C. simplex Giesbrecht	1	—	—
		Sapphirina angusta Dana	18		—
		S. nigromaculata Claus	1	—	—
		S. opalina-darwini Haeckel	—	5	—
		S. ovatolanceolata-gemma Dana	6		—
		Copilia hendorfi Dahl	—	1	—
		C. mirabilis, f. *typica* Dana	1	81	—
		C. mirabilis, f. *platonyx* Lehnhofer	—	1	—
		C. vitrea (Haeckel)	—	8	—
	850	*Undinula darwini* (Lubbock)	1	—	—
	1500	*Neocalanus robustior* (Giesbrecht)	6	—	—
		Megacalanus princeps Wolfenden	2	—	5
		Bathycalanus sp. (? *bradyi* Wolfenden)	—	—	1
		Eucalanus mucronatus Giesbrecht	—	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus		1	—
		R. nasutus Giesbrecht	25		—
		Gætanus brevicornis Esterly	1	—	—
		G. kruppi Giesbrecht	1	1	—
		G. pileatus Farran	—	—	1
		Euchirella bella Giesbrecht	1	—	—
		E. galeata Giesbrecht	1	—	—
		E. pulchra (Lubbock)	2	—	—
		E. venusta Giesbrecht	2	—	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
131 D (*cont.*)	1500 (*cont.*)	*Chirundina indica* Sewell	2	1	—
		C. streetsi Giesbrecht	1	—	—
		Pseudochirella obtusa Sars	1	—	—
		Undeuchæta bispinosa Esterly	8	—	—
		U. major Giesbrecht	1	—	—
		Euchæta marina (Prestandrea)	36	7	—
		E. media Giesbrecht	1	—	—
		E. tenuis Esterly	4	—	—
		Paraeuchæta malayensis Sewell	1	—	—
		P. sarsi Farran	1	—	—
		P. tonsa Giesbrecht	—	1	—
		P. weberi A. Scott	4	—	—
		P. withi sp. nov.	—	1	—
		Scaphocalanus magnus (T. Scott)	2	—	—
		Lophothrix frontalis Giesbrecht	2	—	—
		Metridia princeps Giesbrecht	5	—	1
		Pleuromamma abdominalis (Lubbock)	4	—	1
		P. quadrungulata (F. Dahl)	7	—	—
		P. xiphias (Giesbrecht)	17	20	—
		Lucicutia bicornuta Wolfenden	1	1	—
		Heterorhabdus abyssalis (Giesbrecht)	1	—	—
		Hemirhabdus grimaldii (Richard)	—	1	—
		Disseta palumboi Giesbrecht	3	5	—
		Euaugaptilus bullifer (Giesbrecht)	1	—	—
		E. nodifrons Sars	1	—	—
		Candacia æthiopica (Dana)	1	—	—
		C. bipinnata Giesbrecht	2	—	—
		C. pachydactyla (Dana)	2	1	—
		C. varicans Giesbrecht	1	—	
		Sapphirina angusta Dana	—	15	—
		S. opalina-darwini Haeckel	—	4	—
		S. ovatolanceolata-gemma Dana	—	3	—
		Copilia mirabilis Dana	—	43	—
		C. vitrea (Haeckel)	—	2	—
		Corycæus longistylis Dana	1	—	—
	2500	*Megacalanus princeps* Wolfenden	1	—	—
		Paraeuchæta sarsi Farran	1	—	—
136	0	*Undinula vulgaris* (Dana)	—	—	33
		Acrocalanus gracilis Giesbrecht	23	—	6
		Candacia pachydactyla (Dana)	—	1	—
		Corycella gibbula Giesbrecht	5	—	—
145 C	50–0 (vertical)	*Euchirella galeata* Giesbrecht	—	—	1
		Undeuchæta bispinosa Esterly	—	—	2
		Euchæta marina (Prestandrea)	7	1	—
		E. wolfendeni A. Scott	1	—	—
		Scottocalanus dauglishi Sewell	1	—	—
		Candacia æthiopica (Dana)	1	—	—
		C. bispinosa (Claus)	1	—	—
		C. pachydactyla (Dana)	3	—	—
		Copilia mirabilis Dana	—	2	—
	100–0	*Rhincalanus cornutus*, f. *typica* Schmaus	3		
	300–0	*Eucalanus elongatus* (Dana)	8	1	
		Rhincalanus cornutus, *f. typicus* Schmaus	8		—
		Gætanus miles Giesbrecht	2	—	—
		Euchæta marina (Prestandrea)	7	—	—
		Pleuromamma quadrungulata (F. Dahl)	4	—	—
		P. xiphias (Giesbrecht)	1	1	—
		Candacia pachydactyla (Dana)	2	1	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
145 C (*cont.*)	300–0 (*cont.*)	*Copilia mediterranea* (Claus)	—	3	—
		C. mirabilis f. *typica* Dana	1	6	—
		C. mirabilis, f. *platonyx* Lehnhofer	—	1	—
	500–0	*Eucalanus elongatus* (Dana)	—	2	—
		E. mucronatus Giesbrecht	—	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	2		—
		R. nasutus Giesbrecht	1		—
		Euchirella bella Giesbrecht	1	—	—
		E. orientalis Sewell	1	—	—
		Chirundina indica Sewell	3	—	—
		Pseudochirella magna (Wolfenden)	—	—	1
		Undeuchæta bispinosa Esterly	10	—	—
		Euchæta marina (Prestandrea)	4	1	—
		E. tenuis Esterly	—	1	—
		Scottocalanus dauglishi Sewell	4	—	—
		Pleuromamma xiphias (Giesbrecht)	7	5	—
		Lucicutia magna Wolfenden	1	—	—
		Haloptilus chierchiæ (Giesbrecht)	1	—	—
		Copilia mirabilis Dana	—	1	—
145 D	50–0	*Rhincalanus cornutus*, f. *typicus*	1		—
		Euchæta marina (Prestandrea)	3	—	—
		E. wolfendeni A. Scott	1	—	—
		Candacia æthiopica (Dana)	1	—	—
		Oncæa venusta Philippi	1	13	—
		Sapphirina opalina-darwini Haeckel	1	—	—
		Copilia mirabilis, f. *platyonyx* Lehnhofer	—	1	—
	100–0	*Rhincalanus cornutus*, f. *typicus* Schmaus	12		—
		Euchirella bella Giesbrecht	2	—	—
		Euchæta marina (Prestandrea)	3	—	—
		Pleuromamma quadrungulata (F. Dahl)	2	—	—
		Candacia pachydactyla (Dana)	—	1	—
		Copilia mirabilis, f. *typica* Dana	—	13	—
		C. mirabilis, f. *platyonyx* Lehnhofer	—	4	—
	300–0	*Eucalanus elongatus* (Dana)	1	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	4		—
		Gætanus latifrons Sars	—	—	1
		Chirundina indica Sewell	3	—	1
		C. streetsi Giesbrecht	—	—	1
		Pseudochirella magna (Wolfenden)	—	—	1
		Undeuchæta bispinosa Esterly	3	—	2
		Euchæta marina (Prestandrea)	1	1	—
		Scottocalanus dauglishi Sewell	3	3	—
		S. helenæ (Lubbock)	—	1	—
		Pleuromamma quadrungulata (F. Dahl)	1	—	—
		P. xiphias (Giesbrecht)	—	3	—
		Copilia mirabilis, f. *platyonyx* Lehnhofer	—	1	—
	500–0	*Eucalanus elongatus* (Dana)	2	—	—
		E. pseudattenuatus sp. nov.	1	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	10		—
		Euchirella bella Giesbrecht	1	—	2
		E. gapeata Giesbrecht	2	—	—
		Chirundina indica Sewell	2	—	—
		C. streetsi Giesbrecht	—	—	1
		Undeuchæta bispinosa Esterly	8	—	1
		Scottocalanus dauglishi Sewell	9	1	—
		Lophothrix frontalis Giesbrecht	—	—	1
		Pleuromamma abdominalis (Lubbock)	1	—	—
		P. quadrungulata (F. Dahl)	1	1	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
145 D (*cont.*)	500–0 (*cont.*)	*P. xiphias* (Giesbrecht)	4	4	—
		Heterorhabdus abyssalis (Giesbrecht)	—	1	—
		Augaptilus longicaudatus (Claus)	1	—	—
		Candacia pachydactyla (Dana)	1	—	—
		Pontellopsis regalis (Dana)	1	—	—
		Copilia mediterranea (Claus)	—	2	—
		C. mirabilis, f. *typica* Dana	1	5	—
		C. mirabilis, f. *platyonyx* Lehnhofer	—	2	—
172	200	*Undinula vulgaris* (Dana)	—	1	1
		Eucalanus attenuatus (Dana)	2	—	—
		E. elongatus (Dana)	260	3	—
		Rhincalanus cornutus, f. *typicus* Schmaus	57		—
		R. nasutus Giesbrecht	667		—
		Euchirella bella Giesbrecht	1	—	—
		E. orientalis Sewell	1	—	—
		E. pulchra (Lubbock)	—	3	—
		Euchæta tenuis Esterly	5	2	—
		Pleuromamma abdominalis (Lubbock)	—	—	6
		P. xiphias (Giesbrecht)	4	—	—
		Heterorhabdus spinifrons (Claus)	—	1	—
		Euaugaptilus nodifrons Sars	2	—	—
		Arietellus giesbrechti Sars	2	—	—
		Candacia curta (Dana)	—	1	—
		C. pachydactyla (Dana)	—	1	—
		Pontella securifer Brady	1	—	—
		Pontellopsis perspicax (Dana)	1	—	—
	400	*Eucalanus attenuatus* (Dana)	217	33	—
		E. elongatus (Dana)	302	—	—
		E. pseudattenuatus sp. nov.	5		—
		E. mucronatus Giesbrecht	—	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	55		—
		R. nasutus Giesbrecht	744		—
		Gætanus pileatus Farran	2	—	1
		Euchirella galeata Giesbrecht	62	—	22
		E. orientalis Sewell	82	23	—
		E. truncata Esterly	2	—	—
		Chirundina indica Sewell	23	—	—
		Undeuchæta bispinosa Esterly	19	1	—
		Euchæta tenuis Esterly	56	15	—
		E. media Giesbrecht	4	—	—
		Paraeuchæta weberi A. Scott	2	—	—
		P. investigatoris Sewell	2	9	—
		Scottocalanus dauglishi Sewell	76	57	—
		S. securifrons (T. Scott)	18	11	—
		Scaphocalanus magnus (T. Scott)	1	—	—
		Metridia princeps Giesbrecht	—	1	—
		Pleuromamma abdominalis (Lubbock)	21		—
		P. indica Wolfenden	1		—
		P. quadrungulata (F. Dahl)	7	—	—
		P. xiphias (Giesbrecht)	97	125	—
		Heterorhabdus abyssalis (Giesbrecht)	2	—	—
		H. spinifrons (Claus)	1	—	—
		Arietellus giesbrechti Sars	—	1	—
		Candacia pachydactyla (Dana)	2	1	—
		Pontella fera Dana	—	1	—
		Copilia mirabilis Dana	1	2	—
	850	*Calanoides patagoniensis* Brady	—	—	—
		Undinula vulgaris (Dana)	1	—	—
		Megacalanus princeps Wolfenden	—	—	2

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
172	850	*Eucalanus attenuatus* (Dana)	329	144	—
(*cont.*)	(*cont.*)	*E. crassus* Giesbrecht	1	—	—
		E. elongatus (Dana)	556	11	—
		E. monachus Giesbrecht	5	—	13
		E. mucronatus Giesbrecht	—	—	—
		Rhincalanus cornutus, f. *typicus* Schmaus	129		—
		R. nasutus Giesbrecht	1,249		—
		Gætanus miles Giesbrecht	2	—	—
		G. minor Farran	1	—	—
		G. brevicornis Esterly	1	—	—
		G. kruppi Giesbrecht	63	1	3
		G. pileatus Farran	—	—	1
		Euchirella galeata Giesbrecht	38	—	5
		E. orientalis Sewell	61	16	—
		E. pulchra (Lubbock)	—	4	—
		Chirundina indica Sewell	63	—	—
		C. streetsi Giesbrecht	—	—	9
		Undeuchæta bispinosa Esterly	56	1	—
		Euchæta marina (Prestandrea)	1	—	—
		E. media Giesbrecht	1	—	—
		E. spinosa Giesbrecht	1	—	—
		E. tenuis Esterly	74	5	—
		Paraeuchæta investigatoris Sewell	36	9	—
		P. malayensis Sewell	4	1	—
		P. sarsi Farran	1	1	—
		P. spinifera Esterly	—	1	—
		P. tonsa Giesbrecht	—	1	—
		P. weberi A. Scott	18	—	—
		Xanthocalanus greeni Farran	—	1	—
		Onchocalanus affinis With	1	—	1
		O. trigoniceps Sars	1	—	6
		Scottocalanus securifrons (T. Scott)	1	—	—
		Scaphocalanus magnus (T. Scott)	10	—	—
		Lophothrix frontalis Giesbrecht	10	1	2
		L. quadrispinosa Wolfenden	4	—	—
		Amallothrix arcuata Sars	2	1	—
		A. emarginata (Farran)	1	—	—
		A. gracilis Sars	1	—	—
		Metridia princeps Giesbrecht	3	1	1
		Pleuromamma abdominalis (Lubbock)	17		—
		P. indica Wolfenden	—	1	—
		P. xiphias (Giesbrecht)	139	108	—
		Gaussia princeps (T. Scott)	—	1	—
		Lucicutia challengeri Sewell	32		—
		Heterorhabdus abyssalis (Giesbrecht)	2	—	—
		H. spinifrons (Claus)	—	1	—
		Hemirhabdus truncatus (A. Scott)	1	—	—
		Disseta palumboi Giesbrecht	6	5	7
		Euaugaptilus elongatus Sars	1	—	—
		E. facilis (Farran)	1	—	—
		E. indicus Sewell	—	—	1
		E. laticeps Sars	—	—	1
		E. latifrons Sars	1	—	—
		E. longicirrhus Sars ?	—	—	1
		E. longimanus Sars	—	—	1
		E. magnus (Wolfenden)	—	—	3
		E. nodifrons Sars	1	—	—
		E oblongus Sars	2	—	—
		Augaptilus longicaudatus (Claus)	1	—	—

Sta.	Approximate depth of net. (m.)	Species.	♀.	♂.	juv.
172 (*cont.*)	850 (*cont.*)	*Haloptilus chierchiæ* (Giesbrecht)	2	—	—
		H. ornatus (Giesbrecht)	1	—	—
		H. oxycephalus (Giesbrecht)	1	—	—
		H. validus Sars	1	—	—
		Arietellus simplex Sars	1	—	—
		Pachyptilus eurygnathus Sars	1	—	—
		Candacia pachydactyla (Dana)	—	1	—
		Labidocera acuta (Dana)	2	2	—
		Pontella securifer Brady	1	—	—
		Pontellopsis armata (Giesbrecht)	1	—	—
		P. regalis (Dana)	1	—	—
		Copilia mirabilis Dana	—	12	—
	2091	*Calanoides patagoniensis* Brady	—	—	2
		Megacalanus princeps Wolfenden	—	—	2
		Rhincalanus cornutus, f. *typicus* Schmaus	1		—
		R. nasutus Giesbrecht	11		—
		Valdiviella insignis Farran	2	—	—
		Paraeuchæta hanseni (With)	1	—	—
		Pleuromamma xiphias (Giesbrecht)	1	—	—
		Lucicutia challengeri Sewell	1	—	—
		Hemirhabdus grimaldii (Richard)	1	—	—
		Euaugaptilus magnus (Wolfenden)	1	—	—
186	250	*Eucalanus elongatus* (Dana)	191		—
		Rhincalanus cornutus, f. *typicus* Schmaus	1		—
		R. nasutus Giesbrecht	167		—
		Euchirella bella Giesbrecht	4	—	—
		Pontella securifer Brady	1	—	—
	575	*Eucalanus elongatus* (Dana)	830		—
		Rhincalanus cornutus, f. *typicus* Schmaus	12		—
		R. nasutus Giesbrecht	361		—
		Gætanus kruppi Giesbrecht	4	1	—
		Euchirella maxima Wolfenden	3	—	—
		E. orientalis Sewell	23	2	3
		E. pulchra (Lubbock)	—	2	—
		Chirundina indica Sewell	6	—	—
		Euchæta tenuis Esterly	18	3	—
		Paraeuchæta investigatoris Sewell	6	1	—
		Scottocalanus dauglishi Sewell	4	5	—
		Heterorhabdus spinifrons (Claus)	4	1	—
		Heteroptilus acutilobus Sars	2	—	—
	600	*Megacalanus* sp.	—	—	—
		Eucalanus attenuatus (Dana)	67	74	—
		E. elongatus (Dana)	2,741	8	—
		Rhincalanus cornutus, f. *typicus* Schmaus	10		—
		R. nasutus Giesbrecht	1,137		—
		Gætanus kruppi Giesbrecht	42	1	3
		Euchirella galeata Giesbrecht	10	—	2
		E. orientalis Sewell	62	5	—
		E. pulchra (Lubbock)	—	3	—
		Undeuchæta bispinosa Esterly	6	—	—
		Paraeuchæta investigatoris Sewell	61	14	—
		P. weberi A. Scott	2	—	—
		Scottocalanus dauglishi Sewell	56	21	—
		Lophothrix frontalis Giesbrecht	2	—	—
		Pleuromamma xiphias (Giesbrecht)	32		—
		Euaugaptilus magnus (Wolfenden)	1	—	—
	960	*Chirundina indica* Sewell	44	—	—
		Euchæta tenuis Esterly	26	2	—
		Pleuromamma xiphias (Giesbrecht)	33	42	—

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